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VOLUME VI *January 1944* NUMBER 1

PSYCHOSOMATIC MEDICINE

EXPERIMENTAL AND CLINICAL STUDIES

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Dominance, Neurosis and Aggression ..... *Jules H. Masserman and Paul Siever*

Tuberculosis and Personality Conflicts ..... *Jerome Hartz*

Parallelism in Changes of Sensory Function and Electroencephalogram in Anoxia and the Effect of Hypercapnia under these Conditions .... *E. Gellhorn*

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PSYCHOSOMATIC MEDICINE

EXPERIMENTAL AND CLINICAL STUDIES

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PSYCHOSOMATIC MEDICINE[1]

A Historical Perspective

GREGORY ZILBOORG, M.D.

Psychiatric problems have always been considered more or less controversial. The partisan of extreme psychological orientation still finds himself in closer kinship with the philosophical and especially metaphysical premises from which the earliest psychiatric views originated many centuries ago; the partisan of that which we call today extreme organic orientation still finds himself more intimately at home in the purely physiological speculations from which medicine originated in the age of Imhotep or Hippocrates. As far as psychiatry was concerned, the dichotomy body and mind (or soul) remained the cornerstone of medicine for ages. As late as the close of the eighteenth century it was still the philosopher who claimed psychiatry as his domain, while the medical man studied the body and the body only, shying away from psychology and perennially attempting to deal with psychopathology by means of pharmacology or purely physical agencies.

Of recent years a solution has been sought in the form of a synthesis of what psychopathology has learned and what physiology has taught us, and finally the term "psychosomatic medicine" appeared, marking an attempt to bridge the gap between psychopathology and general medicine and seeking for a unified approach to the clinical problems involved.

It is no longer novel to point out that this approach is actually not a new one. The problem of the relationship between body and soul is almost as old as human thought, and at any rate as old as medicine itself.

Aristotle, in *De Anima*, stated explicitly: "Probably all the affections of the soul are associated with the body—anger, gentleness, fear, pity, courage and joy, as well as loving and hating; for when they appear the body is also affected. There is good evidence for this. Sometimes no irritation or fear is expressed, though the provocations are strong and obvious; and conversely, small and obscure causes produce movement, when the body is disposed to anger, and when it is in an angry mood. And here is a still more obvious proof. There are times when men show all the symptoms of fear without any cause of fear being present. If this is the case, then clearly the affections of the soul are ideas expressed in matter. Their definitions therefore must be in harmony with this; for instance, anger must be defined as a movement made by a body in a particular state, or by a part, or by a capacity of such a body roused by such a cause, with such an end in view."[2]

Thus Aristotle. And from the days of the peripatetic philosopher to Julian Huxley, medical science and biology have been struggling to find an integrative formula, an approach which would offer both a methodological unity and an empirical coherence to our clinical studies.

This problem was not fully crystallized until the beginning of the nineteenth century, when the first true attempt at a synthesis was made. Before that time the physician interested in psychological problems faced the choice of borrowing heavily from the philosopher or remaining within the narrow confines of anatomy and a rather rudimentary neurophysiology.

The concept of personality was slow in developing, since it was only in the latter part of the sixteenth century that the individual was discovered. No working concept of emotions existed. They were called passions, a term which in addition to being descriptive carried with it a connotation of opprobrium, or at least philosophical and ethical condemnation. Descartes (1596–1650) was the first to express preference for the more objective-sounding term "emotion," but it took almost another hundred and fifty years before this term acquired its rights of citizenship in the scientific psychological literature. The general approach to mental disease was strictly ethical if it was not anatomico-physiological; Heinroth (1773–1843), at the turn of the nineteenth century, and a number of psychiatrists up to the late 'forties of that century, still sought the cause of mental disease in the

[1] Read before the combined meeting of the New York Neurological Society and the Section of Neurology and Psychiatry of the New York Academy of Medicine, April 13, 1943.

[2] Aristotle: *On the Soul*, 1, 1.

badness and sinfulness of man. To be mentally ill meant not only to think wrongly but to be fundamentally in the wrong in relation to the religious and moral precepts of life.

Even as late as 1842, as Helmholtz testified, there were no clinical laboratories; the conception of physical diagnosis was rather diffuse and the practice of it desultory. Medicine, and particularly psychiatry, was learned primarily from books and not from patients.

Physicians who seemed to have gained true insight into psychological phenomena were disregarded on the whole and relegated to the pile of more or less queer doctors who had wandered off into philosophy and had therefore been forgotten. Georg Ernst Stahl (1660–1734), whom we may rightly call the originator of many a modern psychobiological idea in medicine, left no scientific issue, except a rather thin line of scientific followers from Langermann (1768–1832) to Ideler (1795–1860), whose influence on medical psychology did not begin to tell until the twentieth century, and then only in a rather anonymous way.

As a result of many world-shaking events, such as the French Revolution and the Napoleonic Wars, it was Germany that became for a considerable time the center in which new and brilliant psychiatric ideas began to be fermented and distilled. It was there that the battle between the extreme somatologist and the extreme abstract and moralistic psychologist was fought.

This battle is full of fascinating details; it has been told more than once and it need not occupy us here. Only some of the earlier attempts to bring about an empirical, clinical synthesis between psychology and biology will be briefly recorded.

By the end of the fourth decade of the nineteenth century the issues were drawn with utmost sharpness, with the weight of academic victory definitely pulling in favor of the more aggressive and self-assured somatologists, among whom the most typical and most brilliant medicopsychological "stand-patter" was Johannes Baptista Friedreich (1796–1862). His *Handbuch der allgemeinen Pathologie der psychischen Krankheiten*, embracing 670 pages, was published in 1839. Six years later Griesinger (1817–1868) published his textbook, reasserting that "mental disease is brain disease"; he also spoke with considerable prophetic insight of "cerebral reflexes." Griesinger did not depart from Friedreich's dictum that "Every mentally ill person is also physically ill." While speculating along broad philosophical lines on will, imagination, and sensation, these men sought the ultimate cause of mental diseases in the bodily pathology, particularly that of the brain; there was little in their views that suggested a functional, unitary concept of man. The term "nervous diseases" dates from this period; it was used interchangeably with the terms "psychic" or "mental" diseases. "Personality diseases" or "disturbances", a designation introduced by Ritgen (1787–1867), was not yet in use.

One year before Friedreich's textbook appeared, Ernst von Feuchtersleben (1806–1849) published his *Zur Diätetik der Seele* (1838). The very title implies a new orientation; it is suggestive of what we would call today mental hygiene. The book was extremely successful and went through fifty editions. Feuchtersleben insisted that the consideration of psychological factors is of much greater value than the fancy apothecary mixtures. He insisted as early as 1842 that psychiatry be taught to senior medical students, and when he was granted permission to give a course on mental diseases so many of the medical students came to hear him that the other professors of medicine and surgery complained that their classrooms were deserted. He was the author of the first Austrian textbook on medical psychology, which he published in 1845; this book was so successful that it was translated into English, French, Dutch, and Russian. It was Feuchtersleben who first spoke of the "psychophysical totality of man."

The time was apparently growing ripe for a new and more comprehensive scientific conception of man. "Whenever abnormal psychic manifestations are present," said Feuchtersleben, "we deal with a mental disease. It has its root in the psyche in so far as the latter uses the sense organs; it is also rooted in the body in so far as the latter is the organ of the psyche."

Since the organ monopolizing the functions of the psyche was considered to be the central nervous system, Feuchtersleben was also led to state that every psychosis is also a neurosis, because no change in psychic life comes to expression without nerves; but not every neurosis, that is to say, not every organic disease, was considered a psychosis—a mental disease.

What Feuchtersleben had to say toward the middle of the nineteenth century did not come, of course, suddenly, nor was it represented by an

isolated individual. Like all psychiatry, this orientation was created and nurtured by medical science, which ultimately succeeded in annexing the field of psychopathology from the philosopher and poet, the great masters and lords of this territory who, like all masters and lords, ruled supreme without true understanding of their own kingdom. It was the generation of German medicine which matured by the time Europe became liberated from the Napoleonic turmoil that was particularly keen in its search for a new and more scientific understanding of medico-psychological problems.

Those concerned with the problems of psychosomatic medicine today owe a great deal to that generation, particularly to Nasse and Jacobi.

Christian Friedrich Nasse (1778–1851) was by far the more original of the two men. Both were interested in the same problems and to both goes the credit for the earliest, most scientific attempts to establish definite views on child psychiatry. But Nasse was so much more active a research worker and clinician that some of his contemporaries and many later historians of medical psychology were inclined to believe that most of Jacobi's ideas were borrowed from Nasse. Nasse was a medical physiologist and ardent clinician; it was he, more than anyone else of his time, who established on a scientific footing and perfected the art of physical diagnosis. Auscultation, percussion, and the use of the clinical thermometer were not new in his day, of course, but Nasse raised their use to their proper integrative, scientific role. He correlated the clinical findings; he invented a special percussion cylinder and spoke of "cylinder symptoms"; he invented a special thanatometer ("death measurer") to record the temperature inside the stomach, believing that the fall of the temperature in this region was indicative of the approaching lethal exodus. He made it a rule, in his course of medicine, to demonstrate daily to his students, in groups of five or six, several mental patients. This was not an easy task. He had no hospital at his disposal in the University of Halle and would go to see the mental cases in the cellar of the city jail, where the patients were kept. He would examine the excreta of the patients, using also the microscope for this purpose.

In short, Nasse had organized a laboratory for physical diagnosis. As early as 1818 he started a journal, "Zeitschrift für psychische Aerzte." He tried to make some observations on what appeared to him to be mental diseases in animals. He not only sought to understand the relationship between mental illness and the physiological economy but introduced an original note which is particularly familiar to the present-day psychiatric clinician, in stating that any physical disease produces a disturbance in the relationship between the psyche and the soma.

His contemporary and friend Jacobi (1775–1858) had been thinking along the same lines and for a while was engaged in a serious discussion as to whether the term "mental disease" or "mental disturbance" should be given preferential usage. He favored the latter. He came out with a sharp protest against the use of bloodletting, emetics, purgatives, and similar drastic measures which had been in vogue for almost fifteen hundred years, stating that "hundreds of patients are sacrificed every year to the stormy and unintelligent measures which seek to quiet the patients by most aggressive means."

In 1838 Nasse and Jacobi founded a new publication bearing the name "Zeitschrift für die Beurteilung und Heilung der krankhaften Seelenzustände." Only one volume of this journal appeared. The previous year Jacobi had started the publication of the "Annalen der Irrenheilanstalt." In the opening issue of this latter journal Jacobi pointed out that psychiatry was still very young and that its methods of treatment were still undeveloped. He saw no better way to further greater development of this branch of medicine than the publication of carefully prepared case histories. Jacobi himself proceeded to practice what he preached and published twenty-three very detailed histories of mental cases. It was strictly as a clinician that he formulated his psychiatric concepts. In the first and only issue of the "Zeitschrift für die Beurteilung, etc.," Jacobi published three articles: one on the construction of a mental hospital in the Grand Duchy of Baden and on a few public mental institutions in England; another on certain observations of kleptomania in mentally ill; and a third bearing the title, "Further discussions of the foundation of somato-psychic medicine."

As far as I know this is the first formulation of a concept and of the intent of psychosomatic medicine, which is therefore over a century old.

It is of interest to note that the Jacobi-Nasse conceptions were born at a time when medicine had fallen into the extremes of organic orientation. Under the influence of the rapidly developing sci-

ences of chemistry, anatomy, and physiology, medicine rejected with considerable fervor anything psychological, while psychology, steeped in metaphysics, attempted to introduce into medical psychology a kind of panpsychological, panethical, mystical philosophy. This sharp cleavage for a while threatened to impede the development of psychiatry almost fatally; it was finally clinical medical science that sought and found a proper synthesis.

Mutatis mutandis our times are not dissimilar from the days when Jacobi and Nasse began to practice psychiatry. The overpopularization of certain psychological discoveries made at the turn of the nineteenth century has created a reaction against psychology and psychiatry. At the same time medicine, by way of the same reaction, tended to become extremely somatological. The reappearance of the term "psychosomatic medicine" and of the concept of the psychobiological unity of the human being mark a renewed attempt to produce a synthesis of the total reactions of the human personality, a process started one hundred years ago with less scientific equipment although with great clinical intuition.

Whether psychosomatic medicine in this its revival, as an attempt to integrate psychopathology with heretofore isolationist biology and physiology, is to be considered a new specialty or a new form of medicine is a question that only the future can decide. Certain it is that, judging on the basis of historical precedent, only the true psychological enlightenment of general medicine will bid fair to produce a true scientific synthesis.

DOMINANCE, NEUROSIS, AND AGGRESSION

An Experimental Study

JULES H. MASSERMAN, M.D.* and PAUL W. SIEVER, M.D.*

Psychologists and psychoanalysts have long been interested in the dynamic interrelationships of aggression, dominance and neurosis, particularly as to whether aggressivity is an "inherent" behavior pattern or an adaptive reaction to anxiety and frustration. It is our purpose in this paper to report an experimental investigation of these problems.

METHODS[1]

In an automatic apparatus described in previous communications (10, 11, 12) 16 cats were separately trained to respond to a bell-light signal by opening a food box to obtain a single pellet of food. The cats were then paired until one member of each pair became "dominant"—i.e., secured the food on signal while the "submissive" cat made no effort to do so. With further pairings and combinations, a hierarchy of dominance was then established in three groups of four cats ranging from (1) the cat that secured the food on signal under all circumstances, through (2) and (3)—cats that would attempt to get the food only if more dominant animals were not present, to (4), a submissive animal that responded to the signals only when alone in the cage. The dominant members of each hierarchy were then made "neurotic" in turn by subjecting them to one or more harmless but unexpected air-blasts or electric shocks at the moment of food taking, and the behavioral aberrations so induced were studied when the animal was alone in the cage and when it was placed with animals higher and lower in its dominance series. Finally, the neurotic animals were given injections of various drugs that temporarily mitigated their neurosis, and the changes in their individual and group behavior were observed.

In a fourth group of four cats, each was trained to manipulate an electric switch which actuated the feeding signals and the automatic feeder mechanism. The animals were then paired and placed in an experimental situation arranged so that the animal which worked the switch could not reach the food box until after its partner had secured the food, and the interactions so occasioned were observed.

RESULTS[2]

Since the observations in each of the three groups of four cats subjected to competition for food on conditional signal were essentially similar, the results in Group I only will be described. The experimental histories of the individual animals in this group, numbered in the order of future dominance, may be summarized as follows:

Amy—1 (female): When six weeks old, this animal was placed in the experimental cage and exposed to a sudden air blast which precipitated a startle reaction and vigorous attempts to escape. She was then kept in the animal room without further experimentation for eighteen months, during which time she showed no abnormalities of behavior other than gradually diminishing hypersensitivity to sudden sensory stimuli in any modality. When replaced in the training cage for the dominance experiments she paced it restlessly, again attempted to escape, cowered at the food signals and could not be induced to approach the food box until her hunger had mounted for three days. Nevertheless, once she had taken the food she rapidly learned to open the food box on signal and lost all fear of the experimental apparatus; in fact, she resisted removal from it even when her hunger was satiated.

Patches—2 (male): This animal had had no contact with the experimental cage until the dominance experiments. He took food from the box on the first day, and after only 16 signals, learned to

* From the Division of Psychiatry, Department of Medicine, and the Otho S. A. Sprague Institute, University of Chicago.

[1] For a detailed account of the apparatus and methods employed in this laboratory for producing conditional meaning-responses and experimental neuroses in animals, see references (10, 11).

[2] For a detailed description of the induction, symptomatology and methods of "therapy" of experimental neuroses see reference (11). The experiments in dominance and animal cooperation have been directly recorded in fully subtitled motion picture films (13, 14, 15) distributed by the Division of Psychiatry of the University of Chicago.

respond to them by prying open the lid of the box. Patches resembled Amy in being a lithe, energetic animal who explored the cage actively between signals.

Dusty—3 (male): Like his litter-mate, Amy—1, Dusty had been exposed to a sudden air blast at the age of 6 weeks, showed similar residual fear-reactions to the cage and to the food-signals 10 months later, and required 14 days of training to acquire an unhesitant and efficient feeding response. Unlike Amy, however, he was habitually rather inactive and sat quietly and somewhat defensively in a corner away from the food-box between signals.

Blackie—4 (female): This cat was the mother of Amy—1 and Dusty—3. Two years before the present experiments she had been trained to open the food box in response to the bell-light signals and had then been exposed to air-blasts at three successive food takings. This procedure induced typical "neurotic" behavior: refusal of food in and out of the cage, panic reactions to sensory stimuli and to space constriction, ritualistic, patterned "compulsions" such as crouching in a strained posture near the source of the air-blast, suspiciousness and intolerance of other animals, and marked diminution of spontaneous activity. These "neurotic symptoms" improved markedly when the animal's attempts to escape from the cage were completely blocked and she was induced to overcome her inhibitions and phobias by gentle, patient retraining to take food on signal. She was then given a rest period of two years, during which her behavior in the animal room was normal except for transient startle reactions to hissing noises directly reminiscent of the "traumatic" air blast. When replaced in the experimental cage during the present experiments she at first showed no residual reactions to the feeding signals, but when the food pellets were openly displayed in the box immediately after the bell and light stimuli she again associated the two rapidly and within half an hour was opening the box promptly and consistently on signal. At other times, however, she remained relatively quiet and constrained.

Each cat was given from 20 to 30 conditional feedings daily for about three weeks. During this period they avidly entered the experimental cage, remained friendly to the experimenter, and continued to respond promptly to the feeding signals until satiated. As a further control procedure, extinction experiments were carried out in each animal: i.e., the box lid was held down by an automatic locking device until the animal gave up attempts to open it and paid only passing attention to the feeding signals. Interestingly, the cats adapted to this mechanical frustration with a facility that corresponded to their future dominance rankings: thus, Amy—1 gave up trying to open the box in 6 trials, Patches—2 in 7, and Dusty—3 in 9, whereas Blackie—4 continued to try to force the lid open for 12 successive signals. However, the feeding response was promptly re-established in each cat by releasing the lid and displaying the food after from one to three conditional stimuli.

Dominance Patterns in Initial Pairings

Amy—1 and Dusty—3 were placed together in the experimental cage and at each feeding were allowed to compete for the single pellet dropped into the food box by the automatic feeder. Both cats at first opened the lid almost simultaneously, but Amy—1 soon developed the technique of running around to the right of the box and using her left forepaw to push Dusty's head away from the food. After twenty such experiences Dusty stopped responding to the signals altogether and passively watched Amy take the next forty feedings; however, when Amy was removed from the cage Dusty promptly fed on signal and continued to do so until satiated. The next day Dusty showed a transient, non-aggressive resistance to having his head pushed away from the food by Amy's paw, but he secured only 12 out of 60 feedings and soon retreated to a corner of the cage away from the food box, where he sat licking and preening himself while Amy fed. When Amy was removed from the cage, Dusty again fed promptly for 80 signals—apparently beyond the point of mere hunger satiation—and even then continued to open the box on signal without taking the food. On the third day Dusty lay quiet until Amy, after the first 52 feedings, began to be desultory in opening the box. Then Dusty reasserted himself, shouldered Amy away, and fed until satiated. Nevertheless, the next day, after some competition on the first two trials, Amy reasserted dominance and Dusty again waited until he was alone in the cage before attempting to respond to the feeding signals. This pattern remained constant during two weeks of observation even when Dusty, after Amy's removal from the cage, was given insufficient food to allay his hunger or maintain his weight.

During the first two days, when both cats were

separated from the food box by a transparent barrier, each struggled to reach the passage leading to the box at the conditional signals. On the third day, however, Dusty—3 began to abandon such attempts when Amy—1 was present on either side of the barrier and sometimes refused to pass it even when alone in the cage; moreover, at such times Dusty often responded to the signal by walking in a direction *away* from the food. This abnegation, however, never reached the point of refusing to respond to the signals when alone in the cage and close to the food.

Aggressive Behaviour: Aside from the inevitable crowding at the food box on the first and third days of competition, no overt aggressivity was shown by either animal in or out of the experimental cage.

Patches—2 and Blackie—4: In this pairing Patches assumed dominance almost from the outset. Blackie approached the food box in response to the first four signals, but on being casually shouldered aside in each instance, thereafter stood by and watched Patches feed. Only when the latter left the food box would Blackie venture to open the lid in a vain search for food; but after 17 such trials Blackie—4 lay down in a far corner, faced away from the food box and, like Dusty—3, reacted to the signals only by preening herself more industriously. Nevertheless, as soon as Patches—2 was removed from the cage, Blackie—4 promptly responded to the same signals by opening the food box and eating the pellet. This behavior continued for three days and, after a rest period of five days, reappeared unchanged for another week of observation. However, a regional reversal of dominance occurred when the cats were placed behind the passable barrier; here Blackie almost invariably forced Patches away from the opening to get to the food box first; but once there, she submitted to Patches' pre-emption of the food itself in her usual submissive manner.

Amy—1 and Patches—2: After these cats had established consistent dominance over their initial partners as described, they were placed in competition with each other. At the first 8 signals Patches got to the food box first and snatched the food. Amy, who had previously been successful in this respect and had never before shown aggressivity, now snarled and clawed at Patches, who cowered without fighting back. In this way Amy asserted dominance and thereafter secured the food on signal without further aggression other than pushing Patches' head away in the same manner that she had employed with Dusty—3. But now the pattern of aggressivity was reversed: from the second day onward Patches repeatedly and often viciously attacked Amy. Significantly, such attacks always occurred between feedings and caused Amy to cower and retreat in turn; at the signal, however, Patches invariably desisted and permitted the dominant Amy to secure the food. This pattern was less well marked behind the barrier where Patches sometimes crowded Amy away from the passageway, but once Amy got near the food box Patches offered no further competition.

Dusty—3 and Blackie—4: Dusty, like Patches, almost immediately asserted dominance over Blackie, who passively watched him feed on signal. As previously, however, Blackie fed promptly when alone in the cage.

Group Relationships: Once established, the dominance hierarchy in feeding responses was found to persist in all the possible combinations of the four animals in Group I even after weeks of rest from experimentation. Thus Amy—1 invariably got the food, Patches—2 dominated Dusty—3 and Blackie—4, Dusty—3 fed only when alone or with Blackie, whereas the latter never attempted to feed in the presence of any of the other animals.

Effects of Experimentally Induced Neurotic Inhibitions on Dominance Relationships

Amy—1: Amy was placed in the experimental cage alone and permitted to open the food box on signal, but as she was about to take the pellet a jet of compressed air at mild pressure (about 15 pounds) was blown against the side of her face. She immediately retreated to the rear of the cage and responded to the next 4 feeding signals only by crouching, cowering, pupillary dilatation and horripilation. However, when the lid of the box was raised to display the food, she hesitantly came to the food box and, after 3 more signals, finally opened it. Three conditional feedings were permitted, then she was again subjected to the air blast at the moment of food taking. This time she retreated even more precipitately and, in contrast to her usual exuberant behavior, remained crouching and immobile in a far corner for the rest of the experimental period. The next day she hesitantly opened the box at the first signal but refrained from taking the food; thereafter, although no air blast was given, she abandoned even this

response and during the next week showed characteristic tense immobility, refusal of food and startle and phobic reactions to the signals.

Blackie—4, the most submissive animal in Group I was then placed in the cage with Amy. At the first feeding signal Blackie showed some hesitation, but when she observed Amy's negative reactions to the same signal, she slowly opened the food box and took the pellet; moreover, this response rapidly became more prompt and efficient on subsequent signals. Amy at first observed Blackie's feeding passively but, as it continued, she herself began to approach the food box, and, after seven more trials, she was again shouldering Blackie away from the food. Interestingly, however, when Blackie was removed from the cage Amy stopped responding to the signals unless the moveable barrier was used to force her inescapably against the open experimental box in full view of the food.

Reinforcement of Neurosis: When Amy's feeding responses had been re-established by these methods, a more drastic inhibition was introduced by giving her a harmless condenser shock through the grill floor of the cage at the moment of food taking. Following this, she remained habitually crouched away from the food in an almost cataleptic posture, cowered intensely at the signals and seemed entirely unaware of the feeding activities or even of the presence of Patches—2, Dusty—3 or Blackie—4 when they were placed separately or together in the cage with her. Judging from her conduct, Amy's inhibitions, apparently because of the induction of repeated and increasingly severe motivational conflicts, had become so intense and generalized that she could neither re-establish her feeding responses through re-asserting dominance over the other cats nor deviate her energies into aggressivity against them; her adaptations to this "catastrophic" situation therefore were in the direction of exclusion of perceptions (although with some persistent phobic manifestations) and a retreat into immobility and passivity.

Further Reversal of the Dominance Hierarchy: In his turn, Patches—2, now the dominant animal in Group I, was also subjected to four irregularly spaced air blasts at four feeding responses, and reacted by developing a marked feeding inhibition. In Patches' case, however, this was not sufficiently severe to abolish all activity; instead, he paced the cage restlessly and reacted to the feeding signals by mewing, bristling and clawing at objects in the cage. Dusty—3, previously submissive to Patches, was then placed in the cage with him, and almost immediately began feeding at the signals despite Patches' presence. Patches reacted to this contravention of his dominance as he had done with his previous superior, Amy—1, before the latter was made neurotic: i.e., he made no attempts to keep Dusty—3 from securing the food at the feeding signals, but attacked him viciously with tooth and claw between signals. This behavior continued when all four cats were in the cage: Dusty—3 secured the food; Patches—2 attacked him; Blackie—4, still dominated by Dusty, explored the cage or preened herself at the food signals and opened the food box occasionally only between them, whereas Amy—1, severely neurotic, remained crouched and inactive deep in a corner away from the others. Moreover, when Dusty—3 was removed, Blackie—4 immediately responded to the signals by taking the food, but under such circumstances she in turn became the object of Patches' attacks. These ceased after several days when Patches—2, apparently profiting by Blackie's example, gradually re-established his own feeding responses and began to shoulder Blackie away from the food box instead of attacking her between signals. Blackie, as usual, immediately surrendered the food, but reacted to the loss of her temporary dominance by developing aggressive behavior for the first time in the experiment. In practice, she permitted Patches to take each feeding, but then attacked him with a fury and efficiency that demonstrated that her previous acceptance of the lowest rank in the group could not have been due to her lack of fighting ability. Consistently too, this aggressiveness disappeared when Patches' food inhibitions were re-established by the air blast and Dusty—3 was also made neurotic by the same technique. When this occurred Blackie, now unopposed, took the food on signal but herself became the relatively passive object of attacks by Patches and Dusty. Thus the original feeding hierarchy had become completely reversed: Blackie—4, the previously most submissive cat, alone fed on signal; Dusty—3 and Patches—2 refused to feed but attacked Blackie, whereas Amy—1, previously most dominant, lay starving, huddled and immobile. Moreover, this pattern of interaction persisted when the group was fed with or without signals outside the experimental cage, although under these circumstances various distractions and increased freedom of motion and escape complicated the experimental observations.

Re-establishment of the Original Dominance Hierarchy

1. Effect of Sodium Amytal: In previous studies (12, 15, 23) it was shown that morphine, ethyl alcohol and certain barbiturates act psychobiologically to disorganize recently-formed, intricate and complexly motivated adaptive patterns into earlier and more direct perception-responses, and thereby temporarily mitigate experimentally induced "neurotic" behavior. To test these psychosomatic effects in relation to the surrender of dominance by neurotically inhibited animals, Amy—1 was given an intraperitoneal injection of 1 cc. of 10% sodium amytal and placed in the experimental cage with the other three cats of Group I. Five minutes after the injection she stopped crouching and cowering, and despite a mild motor ataxia, began to explore the cage actively in a manner reminiscent of her pre-neurotic spontaneity. Moreover, when the feeding signals were given she went directly to the food box, used her paw to push Blackie out of the way, and pre-empted the food in her original dominant manner. When Blackie or Dusty attacked her between signals she avoided combat, but invariably secured the food at the next trial. This pattern of dominance was maintained for the rest of the day, but the next morning, when the effects of the amytal had worn off, Amy resumed her huddled position and again showed phobic responses to the feeding signals, while Blackie, now the only non-neurotic animal, was again ceded uncontested access to the food by the rest of the group.

Similar experiments with morphine and ethyl alcohol were carried out with the other neurotic cats in Groups II and III with corresponding results: temporary relief of feeding inhibitions, restoration of dominance, and concurrent abolition of deviant and frustraneous aggressivity. It was noted that in general the relative doses required for the temporary relief of the neurotic inhibitions varies in proportion to the intensity and fixity of the neurosis in the individual animal.

Therapy of the Experimental Neuroses

In previous work it was shown that the characteristic behavioral aberrations induced by hunger-fear conflicts in animals could be alleviated if the motivational impasse were resolved by one or more of the following methods: (1) forced feeding of the self-starving animals, (2) gentle guidance and retraining in the feeding-response by an experimenter trusted by the animal, (3) starvation to maximal hunger combined with exhibition of attractive food and prevention of escape until the feeding-inhibitions were spontaneously broken through, (4) the example of normal responses in non-neurotic animals, as described above and (5) training the animal to depress a switch which actuated the feeding signals and feeder, and thus providing the animal, even when neurotic, with an opportunity to work through its phobias and inhibitions by spontaneous, re-exploratory, goal-directed activity. These methods were employed in various combinations with each of the neurotic cats in Group I until Patches—2 and Dusty—3 showed no further neurotic behavior and fed as promptly on signal as they had done at the beginning of the experiment. Amy—1, despite several weeks of such training, did not completely recover from her severe neurosis and, when alone in the cage, continued to crouch on signals and fed only when the food box was opened for her by the experimenter. However, when any of the other cats, who now again reacted normally, were placed in the cage with her, her own responses became much more prompt and efficient and she pre-empted the food from them as confidently as she had done before her neurosis. Patches—2 and Dusty—3 likewise resumed their former places in the dominance series, whereas Blackie—4, despite sporadic outbursts of aggressivity, once again surrendered the food to all her group-mates.

Supplementary Observations in Other Dominance Series

Aggressivity: In general, the experimental results in the two other groups of four cats confirmed those in the Group I, although certain supplementary observations merit specific mention. Thus, the two most dominant cats in Group II contested for two weeks to establish their relative positions. During this time no actual fighting occurred, but the eventually dominant animal adopted the technique of using both fore-paws to hold his partner's head away from the food box until the submissive animal no longer attempted to answer the signals. Cat 1 of Group III was at first submissive to Cat 2, but on the third day of competitive feeding suddenly drove his partner away from the food box and thereafter threatened her with snarl and clawstroke until she ceased responding to the signals. When Cat 1 was subsequently made neurotic, he permitted Cat 2 to

feed, but his attacks on her then became overt and vicious. The members of the two other pairs showed variable degrees of overt antagonism when first placed in the cage together, but all bristling and fighting disappeared during the feeding trials and did not reappear until one of the cats had been displaced from dominance by a change of partners or by an induced neurosis.

Substitutive Activity in Submissive Animals: In several series of experiments a white mouse was introduced beneath the grill floor of the experimental cage while feeding signals were given to a pair of cats above. Under such circumstances the dominant cat usually continued to respond to the feeding signals and paid almost no attention to the mouse, whereas the submissive cat readily abandoned the preening or aggressive behavior and immediately concentrated all its attention in attempts to reach and capture the unattainable rodent. Significantly, moreover, when the dominant cat was removed the passive animal immediately shifted her attentions from the mouse to the conditional signals and the currently available food they represented. Submissive animals, when given an opportunity to leave the cage, almost invariably did so, whereas a dominant animal resisted removal until its hunger was satisfied.

Manipulative Interaction

Group IV consisted of four animals trained to respond to the feeding signals in the usual manner. Each animal was then given access to a large, easy-action pedestal switch connected to the feeding signals. When salmon juice was smeared on the platform of the switch the animals, in attempting to lick it, closed the switch circuit, gave themselves the feeding signals, and simultaneously actuated the automatic feeder; in this way they readily learned to manipulate the switch with head or paw and to react to the resultant feeding signals by opening the lid of the food box for the accustomed pellet. An animal so trained would make strenuous efforts to reach the switch if the latter were placed behind a barrier, would manifest restlessness and anxiety if the switch circuit were turned off, and would make no attempt to feed until his manipulation of the switch again actuated the feeding signals. If, on the other hand, the way to the food box were blocked, the animal resorted to frequent manipulation of the switch as a sort of substitutive satisfaction even after attempts to reach the food itself were abandoned.

When two animals trained in the use of the switch were placed together in the experimental cage, various types of interaction developed. If the switch were placed behind a passable barrier away from the food box, the more active of the two worked the switch in his usual manner. However, this proved to be a frustraneous activity since his partner, who remained nearer the food box, promptly responded to the signals actuated by the switch and so secured the pellet. In some cases, especially when the switch-worker had been dominant to the food-recipient in previous competitive feeding situations, he would attack the latter and sometimes drive him away from the food box to the vicinity of the switch; when this occurred the "parasitic" animal rarely offered resistance. In other pairings the parasitic animal, after a few feedings and even though not attacked, suddenly ceased feeding in response to the signals actuated by his partner's efforts, spontaneously walked to the switch, depressed it several times and waited while his partner fed. In this manner alternation of switch-manipulation and feeding developed in some pairs of animals and persisted for from 10 to 24 trials. Another solution was found by the "worker" in one of the pairs; this animal learned to depress the switch for pellets a sufficient number of times in rapid succession not only to provide for his partner at the food box but to leave a few for himself if he hurried to the box before all of the pellets could be consumed.[3]

Finally, one group of 4 cats was taught the switch manipulation technique and subjected to dominance experiments such as those described in Group I. When pairs of these animals were again given access to the switch the submissive one worked it repeatedly, but made few or no attempts to obtain the food as long as any cat dominant to it was present. Under such conditions, however, the "worker" animal even though displaced from dominance by being paired with a higher-ranking partner, seemed to find substitutive satisfaction in the manipulation of the switch, and little aggressivity appeared. Eventually, however, this arrangement broke down, and both animals, even after two days of self-starvation, would lie about the cage deigning to manipulate the signals for the others' benefit. Under these circumstances if one of the animals were removed, the other would, in most instances, proceed promptly to manipulate the

[3] Cf. discussion of Mowrer's comparable studies (11, 19).

switch again for her own feeding; however, some animals seemed to have been so frustrated by the proceeding that a variable amount of individual retraining was necessary before the manipulative pattern was re-established.

DISCUSSION

Factors in Dominance: As has been observed in the group relationships of other species (1, 7, 16, 20) the dominance hierarchies in the experimental feeding situation in the three groups of cats appeared to be relatively independent of the size or fighting abilities of the competing animals. For example, Blackie—4, who because of her weight and agility could easily best all the other cats of her Group I in physical combat, was actually the most submissive in abandoning her conditional goal-responses. Nor was sex a determining factor; the most dominant animal and the most submissive one in Group I were females, and there was no significant sex-dominance correlation in the other groups. Mastery of a problem situation through previous experience seemed to favor dominance. Thus, Amy—1 and Dusty—3, who had been subjected to a "traumatic" but motivationally nonconflictful experience with the air blast during kittenhood and had then been retrained to overcome their residual fear of the apparatus, both tended to assume initial dominance over partners less experienced in the experimental situation. On the other hand, Patches eventually dominated Dusty, and Blackie—4, who had actually been made experimentally neurotic, readily accepted her rank as the most submissive animal in Group I. In general, cats which were characteristically alert, active and assertive emerged dominant in the feeding competition, but in the sixteen cats studied three apparent exceptions to this rule were noted. Further studies of factors in spontaneous dominance are needed, and some of these are in progress.

Goal-Directed Dominance: Our studies thus far have furnished insufficient data as to whether the animals which ranked high in the feeding experiments would also dominate their partners in situations in which other signals or motivational referents were used: i.e., in competition for water, for escape from danger, for a sex partner, for a litter of kittens, etc. But in this connection, it may also be considered that "social" dominance is itself essentially contingent and goal-referential, although some generalization of rank occurs. Thus, a musician, because of his individual and specific abilities, may be the acknowledged and privileged leader of an orchestra, but his lack of experience and adaptability in any other situation—e.g., as a member of an amateur crew on a sailing yacht—may place him, despite a certain amount of borrowed prestige, near the bottom rank in authority and command in the group activities there. As a converse social example, the Admirable Crichton, granted leadership on a desert island by his shipwrecked social "superiors", reverted to his menial position as butler when the group returned to "civilization" and no longer required his special talents and versatilities. In fact, it may be heuristically advantageous to consider "dominance" not as a direct "interpersonal" relationship between or among organisms, but as an angular vector leading from organism to goal and *intermediately* to one or more competitors for that goal. In this sense a submissive organism does not resign directly to a dominant one, but adapts himself as well as he may (e.g., by self-inhibition or substitutive activity) to the pre-emption of that goal by a more successful competitor. One of these adaptations, however, may take the form of aggressive discharges of energy directed toward inanimate or animate objects that indirectly obstruct the goal: in the latter case, the "dominant" animal.

Neurosis and Fear

It may be contended at first sight that the animals which acquired persistent food inhibitions and other behavior aberrations after being subjected to an air blast during a feeding response were not really "neurotic" but were merely exhibiting the "normal" reactions of fear. This concept has been more fully discussed in other connections (11), but it may be pointed out here that certain of the behavior changes induced (e.g., fixed immobility, self-starvation, or frustraneous openings of the food box) could hardly be considered as directly adaptive to danger, whereas other reactions, such as phobic avoidance of harmless sensory stimuli and anxious, compulsive, ritualistic or regressive behavior patterns, resembled the corresponding phenomena in human neuroses in being not simply the manifestations of conscious fright alone, but rather frustraneous, vacillating and complex expressions of an impasse of contrary motivations. Moreover, it may justifiably be contended that human neuroses also arise from inadequately compromised conflicts of one or more incompatible psychobiologic needs, no matter how complex or

symbolic their symptomatic expression may be. Thus, an obsessive phobia of heights in an adult human subject may be analyzable, on the one hand, to a fear-ridden avoidance of anything symbolic of a punitive, dangerous or forbidding paternal authority—an erect penis or a tall building, but unless this fear runs counter to an unconscious, experientially frustrated desire in the subject himself to "grow up", "reach heights" and challenge that fearsome authority, the phobic defenses against heights are psychobiologically unnecessary and do not develop. Similarly, as reported in our previous work, animals subjected to sensory signals followed by a fear-inspiring stimulus such as an air blast readily adapt themselves to both the "traumatic" experience and its "conditional" signals, but if the signals are made to herald a situation which induced a motivational *conflict* such as between hunger and fear, neurotic reactions of various types and intensities are induced.

Frustration, Neurosis and Aggression

It may be profitable for purposes of discussion to make a dialectic distinction between simple environmental frustration, which generally leads to fairly direct adaptation of behavior, and "social" frustration which may induce *conflicts* of motivation and complex "neurotic" behavior. As an example from our experiments, Blackie—4, when mechanically frustrated in her food seeking by the locked box, kept trying to open it for 12 successive signals during which time she occasionally "attacked" it with considerable fury. Nevertheless, in competition with any other animal, she quite readily surrendered the food, even though immediately available in the open box, and reacted, not with aggression, but with avoiding of the box and self-centered withdrawal into preening. It may be noted, however, that when Blackie's material and social frustrations were combined and raised to an intolerable level by placing her with a dominant cat behind a barrier which also blocked access to the food box, Blackie's frustrated drives broke through in the form of aggressions which were now directed against both the barrier and her partner. Similarly when Patches—2 dominated Blackie in the feeding situation, the former obviously suffered little "social" frustration and showed correspondingly little aggression, whereas when he in turn was dominated by Amy—1, Patches' frustrations became all the more intolerable because of his previous "social success," and aggressions appeared forthwith. Conversely, Blackie, accustomed to submissiveness, showed no aggressions toward a succession of dominating partners or when she herself experienced dominance over them after they had been made neurotic and goal-inhibited. However, when they recovered sufficiently again to dominate her, her new frustrations, comparatively greater because of her short-lived experience with dominance, found deviated expression in vicious attacks upon her previously tolerated group-mates.

Effects of Various Drugs on Neurosis and Dominance

The results of the dominance experiments described above amplify previous observations on the symptomatology of experimental neuroses in that the neurotic animal, inhibited in its goal-seeking behavior, also loses its general dominance status in any group in which that goal is the common nidus. Interestingly, when the neurotic goal-inhibitions are temporarily relieved by drugs such as amytal or alcohol which disorganize the recently acquired perception-reaction formations that produce these inhibitions, the animal, along with the transient relief of its neurosis, resumes goal-directed group dominance until the effects of the drug wear off. If similar pharmaco-psychosomatic mechanisms operate at the human level—and clinical experiences indicate that they do—the results of our experiments may serve in part to explain why neurotic, inhibited, socially frustrated patients may resort to barbiturates, morphine or alcohol for a sense of diminution of tension and symptomatic relief—and, once this is experienced, continue the self-medication to the point of addiction.

REVIEW OF THE LITERATURE

Dominance in Animal Groups:[4] Schjelderup-Ebbe (22) has described the dominance hierarchies in flocks of hens, ring doves, canaries and parakeets as follows: "The social order is indicated by the giving and receiving of pecks, or by reaction to threats of pecking; and hence the social hierarchy among birds is frequently referred to as the 'peck order'." Masure and Allee (16) have, in general, confirmed these observations, and have noted further that the initial contacts of two birds usually determined their future dominance relationship in the flock. Moreover, low-ranking birds frequently showed

[4] Excellent reviews of studies in the social interactions of animals low on the developmental scale and their significance for human sociology have recently been published by Allee (2) and Emerson (5).

objective signs of generalized anxiety incommensurate with the actual danger of pecks from dominant birds: cautious movements, isolation, hiding, sex abstinence and even surrender of food to the point of self-starvation. With regard to the genesis of group dominance and submission, Allee (1) has quoted studies to show that a well-developed hierarchy may be observed in a group of human subjects as young and as genetically uniform as the Dionne quintuplets.

Mowrer (20) observed that groups of rats also develop a well defined ascendancy—submission hierarchy. In his experiments three adult rats competed for single pellets of food, and the development of the hierarchy was quantitatively determined by using weight-gain per experimental session as an index. As in Allee's hens, social subordination led to the appearance of "personality changes" in the submissive animals:

"Subordinated rats tend to develop a 'food neurosis', becoming fearful of eating in the experimental situation even though no other animal is present. They also become shy and restrained in their movements in the home cage. More significant still is the fact that their problem-solving capacities are likely to be considerably impaired. 'Intelligence' thus appears to be capable of being depressed by social experience."

In a motion picture film of these experiments, Mowrer, Kornreich and Jaffe (19) record observations which indicate that such "personality changes" may become permanent.

Maslow (9), working with Macacus Rhesus monkeys, observed the behavior of six animals in various combinations. He equated mounting and bullying with dominance, and cringing and flight with subordination. After ranking the monkeys in a dominance scale according to their behavior in all possible combinations of two, he placed them in larger groups and found that the hierarchies changed, in that the behavior of individual animals varied with the size of the group—a phenomenon that was not as well defined in the apparently less complex inter-relationships in groups of fowl, rats or cats. In the case of fowl, Guhl (3) observed that specific bird-to-bird relationships persisted throughout variations in the experimental set-up: "Discriminations were notably influenced by individual differences which indicated that the birds acted and reacted according to individuality and to former pair-contact experiences."

Frustration and Aggression: Dollard and his associates (4), in a comprehensive discussion of the relationships of frustration and aggression, define frustration as "interference with the occurrence of an instigated goal-response" and contend that "the occurrence of aggressive behavior always presupposes the existence of frustration, and, contrariwise, that the existence of frustration always leads to some form of aggression." Moreover, these writers maintain that the following quantitative relationship exists:

"The strength of instigation to aggression varies directly with the amount of frustration. Variation in the amount of frustration is a function of three factors: (1) the strength of instigation to the frustrated response, (2) the degree of interference with the frustrated response, and (3) the number of response sequences frustrated."

This quantitative analysis may also be applied to our animals, since aggressivity appeared in those that (1) had been accustomed to a dominance-favored satisfaction of their feeding response, and thus had a strong "instigation," (2) had then experienced displacement by a more dominant animal or through the development of motivational conflicts and inhibitions and (3) had consequently suffered repeated frustration in their goal seeking. Under such circumstances also, various types of "substitutive response" (defined by Dollard, *et al.*, as "an action which reduces in some degree the strength of instigation, the goal response to which was prevented from occurring") appeared in the form of restless investigatory behavior, changes of objective from food to mouse-chasing, "autistic" licking and preening, or attempts to escape from the field to other environments. Conversely, when the social or neurotic frustrations were experimentally alleviated, deviated aggression correspondingly diminished.

SUMMARY AND CONCLUSIONS

Sixteen cats were individually trained to respond to a signal by opening a food box, and were then combined into groups of four until a dominance hierarchy of food-taking was established in each group. Aggressive behavior did not appear in a dominant animal until it had been displaced downward in rank, either by competition with a more dominant cat, or by the development of neurotic inhibitions induced by a motivational conflict. Conversely, aggressivity diminished or disappeared when the group dominance of an animal was reestablished by the relief of its neurosis or by the

administration of drugs that temporarily disorganized the neurotic apperceptions and associations.

Animals trained to manipulate a switch to secure food on signal showed various patterns of interaction when manipulation of the switch fed another animal: some animals, when paired, alternately worked the switch for each other, while others refused to approach the switch unless each could secure its own feeding after manipulation. In some pairs the submissive animal, after a period of aggressivity, was satisfied to depress the switch a sufficient number of times to feed both its partner and itself. From these experiments and from a review of the literature it is concluded that aggressivity in a goal-competitive situation appears in animals that have once had dominant access to the goal and have then been subjected to social displacement or a motivational conflict that inhibits their goal-directed behavior. These observations may have reference to fundamental reaction-patterns significant alike for individual, comparative and social psychology.

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TUBERCULOSIS AND PERSONALITY CONFLICTS

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Any review of the literature of the past few decades on the relationship between pulmonary tuberculosis and personality disorders is apt to leave one somewhat confused and dissatisfied. Most of the literature on the subject is to be found in the journals of tuberculosis and has largely been written by tuberculosis specialists. Indeed, as one of the best of these specialists, Lawrason Brown (2), has said of this same topic, "Contradiction contradicts contradiction, and the tuberclosis patient is described as anything between an insane criminal and a saint too ethereal for this mundane sphere." This he explains by pointing out that "few articles have been based on recorded observation, many upon the imagined experience of the writer." In a recent review of the subject, Shultz (9) notes that there have been three general viewpoints expressed during this century: a) that the mind is affected by toxic conditions, b) that bodily states are influenced by the patient's emotions, and vice versa, and c) that emotional problems in tuberculosis are the result of cultural and socio-economic conditions which have adversely affected the patients' lives; the modern opinion takes the view that tuberculosis accentuates what emotional maladjustments were present before—the personality of the patient is the determining factor.

Munro (5) held that there is a psychic state specific to, and characteristic of, tuberculosis, and that there is a definite relation between the severity of the disease and the abnormality of the mental states observed. He felt that a specific psychoneurosis accompanies the early or moderately advanced case, while a specific psychosis accompanies the advanced case.

Ross and Stanbury (8) felt that the psychological action of tuberculosis could be thought of as due to the influence of the organic lesion, in which chronic toxemia played a large role, and also to the influence of the concept of the disease on the patient. "The knowledge of his organic affliction produces an immediate affective response in which fear plays a large part." The resulting conflict, they believed, was sometimes completely resolved or else failed of resolution, but in the majority of cases was partially or unsatisfactorily resolved.

Several surveys of the incidence of emotional factors in the etiology and progression of tuberculosis have been made, of which Breuer's (1) and Forster and Shepard's (3) may be cited as typical. About one third of a general unselected series of cases were found to have significant emotional abnormalities by these observers and others, but such abnormalities seem to be distributed very much as is usual in the general population. Breuer felt that there was more serious tuberculosis among the patients with psychological disturbances contributing to the development of their disease.

The common view in the past ten years has been, as Shultz has said, that the previous personality of the patient determines what emotional maladjustment he will suffer with tuberculosis. Lawrason Brown summed up this view by stating, "The reaction to tuberculosis depends upon what the personality was before the onset. This reaction may range from slight nervousness to a definite psychosis. The psychological problem begins with the diagnosis of tuberculosis and in some instances extends through the rest of the life of the patient."

As might be expected, the psychiatrists have had much more sweeping opinions of the importance of personality factors in the disease. Thus Jelliffe and Evans (4) stated, "The nature of many adults suffering from clinical tuberculosis is that of a child, selfish, self-centered, irritable, easily angered, capricious with their food. . . . Their strong infantile reactions, in that they totally disregard others, are egotistical, dissatisfied and ungrateful." In the three cases they analyzed the symptoms were used to insure care and affection from the environment, thus satisfying infantile urges.

In a more extensive study Anita M. Mühl (6, 7) found considerable similarities in the personalities of tuberculous women and concluded that: a) "They have a two-fold, mixed personality which shows strongly marked introvertive qualities suggestive of a precox-like pattern on the one hand, and extroverted tendencies with a manic depressive swing of a greater or less intensity on

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the other. b) The mixed personality is responsible for an immense misuse of energy, and c) The patient may present the most varied picture to the casual observer—according to which group of trends is in the ascendancy, introvert or extrovert."

To the present writer it would seem that what is needed to help us come to a more satisfactory uniformity of opinion is more recorded observations of just how pulmonary tuberculosis and personality difficulties may interact. My interest in the problem arose from a personal experience with the disease when I spent two years at Trudeau Sanatorium in Saranac Lake, New York. For the first year of my stay I was simply a patient, but increasingly thereafter, I was able to work as a doctor doing some routine tuberculosis work as well as serving as psychiatric assistant in both the sanatorium and nearby village. Thus I was able to see something of both sides of a complex problem.

The physical arrangement of the sanatorium is of some interest in explaining the intimacy of contact and the opportunities for observation. All patients are housed either in the infirmary or in cottages. The sickest go to the infirmary which is run on the familiar plan of a general hospital. But the majority of patients live in cottages, that is, small separate houses with from four to twelve occupants. A nurse comes in twice a day and spends a few minutes with each patient; the doctor makes rounds about five times a week. Consequently, each patient is left very much to his own devices and draws on his cottage mates almost exclusively for company. Also, by reason of the intimacy of such contacts, the patient draws most of his early knowledge of the disease from the stories of his cottage mates. Since, at Trudeau, this kind of mutual education is recognized and even encouraged, most patients eventually learn that tuberculosis is more than just a disease of the lungs. Some are able to act on this knowledge, some not—but all learn about it.

As a patient, one soon takes note of the fact that anxiety and mild hypochondriasis are well recognized foibles in the sanatorium. I say foibles because these reactions are viewed with a somewhat detached humor by one's cottage mates. No one is exempt and so everyone smiles at "x-ray fever" or "x-ray pleurisy." These are slight evening elevations of temperature or pains in the chest that may occur for a day or two before routine x-rays are due. Likewise mild anorexia, insomnia, or slight cough meet with half-disparaging sympathy at first—they are assumed to arise from anxiety until proved otherwise.

But all this is on the surface of things and it soon becomes apparent that deep-seated psychological factors play a very important role in the problem of relapse, for example, or as later appeared likely, even in the original development of the disease. As I grew to know my cottage mates intimately I became aware that many had a second history inside them, beyond that which they had told the doctor on admission. This second history was usually the story of how they had been living when the disease, or a relapse of the disease, appeared. In tuberculosis this is extremely significant, for the balance between being well and being ill is sometimes influenced by subtle factors of strain or fatigue. This can best be explained by citing a few cases that I saw which influenced my whole thinking on the subject.

Case 1: The first case is of a 33 year old married man who had worked in the book trade before he became ill. When I first met him I learned what might be called the official story of his illness. He said that he had been well until the spring of 1940 when he became jaundiced suddenly and developed fever. The doctor who saw him told him it was nothing serious, and after one week he was much better. He lost some weight during and after the jaundice but went back to work. Several weeks later he had a small hemoptysis. The same doctor was called who told him he had flu and should stay in bed another week. At the end of this time the patient was advised to have an x-ray of his chest but he put it off—and before it was taken he had another large hemoptysis and became extremely ill. X-ray then showed a cavity in the right apex with almost complete consolidation of the rest of that side and some infiltration on the left. In the fall of 1940 he came to Trudeau, pneumothorax having been started on the right side several months before. He was thirty pounds underweight, coughed heavily, had little appetite and no strength.

A month later, after we had become friends, he suddenly decided to tell me what really had happened before the onset of his tuberculosis. He had been married some years before and the marriage had been successful. In 1939, about one year before the onset of his own illness, his mother-in-law had become very sick with diabetes and hypertension. In rapid succession she became almost blind and partially aphasic. She had no one to look after her so she moved into the patient's household at his wife's insistence. She became a great burden as she was quarrelsome about her diet and continually bemoaned her blindness. The

patient said she soon got on his nerves and made him feel 'creepy' in his own house. He became quite resentful toward his wife when the wife maintained that it was her duty to care for her mother. The patient finally stopped arguing about it but instead took to staying out late with his friends. In a little while he began to drink every evening and rarely came home before midnight; his conscience bothered him but he kept on drinking. After several months he began to grow moody, ate poorly, and was quite irritable. One night early in 1940 he stayed out with a girl he picked up in a hotel bar. Three or four days later he suddenly feared he had caught gonorrhea from her. For a week he tormented himself with reproaches, grew more worried and depressed, and started losing weight rapidly. Then he decided to go to a doctor friend of his and tell him about the supposed gonorrhea. Instead of diagnosis, however, he got treatment consisting of sulfanilamide tablets. It was after this that he developed that jaundice mentioned in the present illness. Because of the circumstances, he and the doctor connived to keep the truth from his wife. Although he was losing weight fast and feeling wretched, he refused to stay at home with his mother-in-law to recuperate, and went back to work. After a short time the first hemoptysis occurred, but again his desire to be out of the house prevented him from taking proper care of himself. The second hemorrhage which followed soon after made him entirely too sick to protest.

On telling this story the patient said that he realized his own folly and blamed no one but himself. However, it was quite plain that his resentment against his mother-in-law was still very much alive within him. He was kept in bed at the sanatorium for nearly a year and a half without any significant improvement, although undergoing a pneumolysis and a phreniclasis during that time. However, early in 1942 his mother-in-law died suddenly, and coincident with this event the patient for the first time showed some improvement. His strength increased, his appetite bettered, and he was allowed out of bed. His condition has improved right along since then, his weight is almost normal, and now for the first time he looks forward to going home.

Case 2: The second case was rather different in outline but as the story unfolded it suggested a similar underlying pattern. This was a nineteen year old single girl I was asked to see in the spring of 1942. She had been having severe anxiety attacks with nausea and vomiting, and was losing weight so rapidly that the staff feared her tuberculosis would break down. Fortunately she responded well to psychotherapy and made a rapid recovery from her anxiety attacks. Her problem centered around her resentment of a self-seeking mother who was making demands far beyond the daughter's ability to satisfy; at the time I saw the patient her mother had for some time been in a fairly severe depression brought on by the daughter's illness.

In this case again the present illness, as recorded in the medical history, was not very enlightening on rereading. It ran about as follows: In December, 1940, the patient had lobar pneumonia from which she made a good recovery. In January she returned to school and in February she had a hemoptysis but said nothing about it because she felt so well. Symptoms of malaise, fatigue and sweats did not appear until shortly after a fall from a horse in April. Although she seemed not to have injured herself in the fall, she complained so constantly thereafter that she was hospitalized in May to determine whether she might not have had a brain injury. Nothing of that sort was found, but an x-ray taken of her chest revealed extensive tuberculosis with cavity. She was sent to the sanatorium in July of '41, had her lung collapsed, and did very well until the onset of the anxiety attacks almost a year later.

About ten weeks was needed to help the patient rid herself of the anxiety attacks, and fully two months of that time was occupied in taking the history. The patient was the only child of two very different parents. Her father was a self-made man; although he had gone only as far as the second grade in school, he had become sports editor of a newspaper in an eastern town and contributed to well-known national magazines. He was an active and aggressive man, humorous and tolerant. His wife was well-educated but of a timid, dependent and retiring nature. She remained under the complete domination of her octogenarian mother who lived with the family. Though the patient resented her grandmother's strict rule, there was no trouble in the family until the mother's first depression when her daughter was ten years old. This psychosis lasted a year during which time the mother remained secluded in her room and was nursed by the grandmother.

Her mother's illness marked a turning point in the life of her ten year old daughter. She clung to her father, became interested in everything he did and said, and ignored her mother as much as possible. The father seems to have welcomed this identification with himself but he chided her for her neglect of her mother, saying, "You must be kind to mother, she is not as strong as we are." The child obeyed, yet her enthusiasm for her father knew no bounds. Her activities in school and out became a perfect mirror of her father's: she became sports editor of the school paper, and when she found she was not a good athlete, became a very successful cheerleader. She was a "joiner" like her father, belonging to every club and society she could.

As she came into high school her activities served a double end. She was so busy with school, clubs, cheerleading and dramatics that she never was home with her mother and grandmother during the day, and as soon as she was allowed, she stayed out nights until 11 P.M. and spent week-ends visiting her schoolmates. There was a note of frenzy in her activities but no one did anything about it. For three weeks before the onset of her pneumonia in December 1940, she was exhausted but

kept going until forced into bed with high fever. The same anxiety to be out of her home explained her neglecting to mention the hemoptysis after she had recovered from the pneumonia and had gone back to school. When she was told she had tuberculosis she was secretly rather glad, for it meant leaving her mother for a long time. The mother promptly reacted to the news of her daughter's illness with another depression and was unable even to correspond with her for nine months. The daughter's anxiety attacks grew severe when she learned at the end of this time that her mother was getting well enough to come and visit her. She envisioned a repetition of the mother's previous nagging demands for affection, and indeed when the mother arrived she at once suggested that the girl leave the sanatorium and come home and stay with her. The problem was resolved by the patient suddenly voicing all her resentment of her mother's behavior in the presence of both of her parents. At any rate this solution was followed by the disappearance of the patient's anxiety symptoms and thereafter she presented no immediate psycho therapeutic problem.

There were few of us who felt that this girl would be able to stay out of difficulties if she returned to a home environment no different than the one she had left. This was explained to the father who said he would try, but apparently he had no success in getting the mother to agree to psychiatric treatment. The patient left the sanatorium a few months later in good condition, but after being home with her mother a few weeks she developed bronchitis and ran a little fever. Within a month the girl returned to the sanatorium; her mother had been committed to a mental hospital and the girl had had a spread of disease to the opposite lung.

Case 3: The third case was studied toward the end of my stay, and was undertaken because the sequence of events was somewhat baffling when viewed only from the standpoint of pulmonary pathology. The patient was a twenty-two year old medical student who was one of a group brought to this country in the fall of 1941 because the outbreak of war promised to interrupt the completion of medical training in his own country. He had finished two years of medical school, and had also spent the year before coming to America doing fellowship work in chemistry. He was sent to one of the large mid-western medical schools where he arrived two weeks after the term began. He was allowed to carry on his studies only about six weeks because his chest plate was read as showing old fibrosis of one apex. Although he was entirely asymptomatic, he was sent to the sanatorium as a precautionary and educational matter. On arrival at the sanatorium in the fall of 1941, he was immediately allowed up for meals, and then had his activities rapidly increased until he was on the maximum allowed by the end of January, 1942. He had remained asymptomatic, gained fourteen pounds in weight, had a consistently negative sputum, and the x-ray appearance of his lesion had shown no change. Suddenly in April, a few weeks before he planned to leave the sanatorium, his Gaffky rose to IV, he had some cough, and x-ray showed a small cavity in the area of the old fibrosis, with some surrounding collateral reaction. From January to April he had lost eight of the fourteen pounds he had previously gained.

He was put back to bed at once—and almost immediately began to improve. In a month's time the cavity had closed, sputum had become negative, and the gain in weight was marked. This course of events was rather unusual, and it was at this time that he was investigated from the point of view of a second, more intimate history. The story he told made what had happened at the sanatorium even more difficult to believe, and until several weeks of discussion had passed it was hard to see much sense in the story.

Undoubtedly, the patient had spent the most active year of his life just before coming to America. He lived in a city which was most heavily attacked by air during the winter of 1940. At this time he was going to medical school and carrying on a research project in chemistry, serving actively as a firewatcher one or two nights a week, working occasionally as a dresser in the hospital first-aid post, and during the height of the blitz was busily engaged in directing and producing a university group in the presentation of a difficult musical score. Although he lost ten pounds during the winter, he had no respiratory symptoms pointing to tuberculosis; and as he pointed out, everyone lost weight because food was so short. But with the harvesting of spring crops he quickly regained the weight he had lost. When, during the summer months of that year, he was given the opportunity of coming to the United States, he jumped at the chance.

All of this made the breakdown of his old fibrosis at Trudeau, under conditions which by comparison were the height of indolence, all the more puzzling. But the story of his development gave some clue, if not a complete explanation, of the cause of this occurrence.

He was the middle child, and only boy, of a family of three. His father had had tuberculosis at the same age as his son, with no recurrence in later life. The father was of a strict Non-Conformist family who all his life held and practiced radical political and economic views. He married an actress with whom he was very happy, and in later life the wife became very active in civic and charitable organizations. Due to the father's unusual economic beliefs, he had had a very checkered financial career, sometimes being in complete poverty but more often attaining a moderate affluence. A great deal of responsibility was put on all the children early in their lives, and the family could never keep a maid because they could not bear to have a social inferior in the house. Later in life the father became more conformist in his attitudes although still maintaining the highest kind of intellectual ideals. He was chosen

for various municipal offices, became a writer on economic problems, etc.

The patient recalled very little of his pre-school life, but knows he was not considered a neurotic baby. However, when he started school at the age of six, his troubles really began. He could not seem to learn to read or do arithmetic, and these were extremely painful failings to have in his family. He had so much trouble that he took to lying about his difficulties and he soon became badly tangled up in his stories. No one seemed to be able to help him and he got the reputation of being a thoroughly "bad boy." This period of being an outcast in his family and school ended about the age of thirteen. At this time he was transferred to a different and very much better school. In two years he had completely reversed his previous reputation and was becoming known as a bright boy. By the age of seventeen, he led the school and was captain of the football team. His work, especially in mathematics and physics, was so good that he won a university scholarship. He was urged to go into physics, but the family ideal for him was medicine, and he agreed. His university career was extremely successful and he was allowed to go at his own pace. He edited the university newspaper, ran a boys settlement club, and reorganized a moribund music association. He was interested in economics and politics, but the outbreak of war in 1939 brought him considerable disillusionment and he turned to religion, becoming an Episcopalian in 1940.

His activities during the terrible winter of 1940 have been detailed. At this time, however, he dropped out of his regular classwork at medical school to spend some time in chemistry. He explained this by saying that the prospect of doing clinical work did not attract him. But then he was chosen to come to America and his doubts were temporarily resolved by his enthusiasm at the new prospect. So, at twenty-two, he came here and was immediately plunged into an educational environment that overwhelmed him. He was thrown into a didactic, lecture-room atmosphere where everyone worked furiously and at topics that seemed a little beyond his knowledge, for in taking the extra time in chemistry, he had neglected to finish his work in pathology—a subject he sorely needed at the moment. The academic pace was rapid, his general adjustment to the new country was difficult, and in a few weeks he found himself hating medical school.

The discovery then of his tuberculosis gave him a great sense of relief, and he went off to the sanatorium hoping to catch up on his pathology, etc., while he rested. Unfortunately the very opposite happened; he began to have grave doubts about wanting to continue in medicine at all, and spent most of his time reading politics and literature. During his first few months at the sanatorium, he was happy and at ease but as the time for his return to school approached, he grew tense, worried about returning to such a strenuous environment, slept very poorly, lost his appetite and began losing weight. Because, perhaps, he was ashamed of his dilemma he told no one what was happening physically and went on trying futilely to make peace within himself. He seemed unable to face the prospect of going back to a school he had come to hate, but his conscience told him he must return. One month before he was to be discharged his tuberculosis suddenly broke down and he was sent back to bed.

As was noted before, his improvement on going back to bed was remarkable. His spirits rose, he began sleeping eight to ten hours a night, and he very soon gained more weight than he had lost. At this time the facts outlined above were known and the desirability of returning to a medical school he so disliked was discussed with him. He insisted on returning there however, claiming that in view of the fact that his tuberculosis had been active so recently, he would be permitted to carry a much lighter load of work and would not be required to finish his medical work at the time originally planned for. Although this seemed to be a solution which avoided the main issue, the patient appeared satisfied and there was no return of anxiety symptoms when he was allowed out of bed the second time. He went back to school in the fall of 1942, but he was sent back to the sanatorium in a month or so because it was felt that his lesion appeared unstable by x-ray, and his sputum had again become positive.

The three cases abstracted above seem to me to suggest that personality conflicts may have a serious contributing role in the onset and progression of pulmonary tuberculosis. The sanatorium life can serve as a refuge and even a goal when normal people are faced with serious personal conflicts in life. And it should be pointed out that pulmonary tuberculosis, from the patient's view, is not such a bad disease to have. Responsibilities are relaxed and the pace of life slowed down; perhaps more important, the patient's family usually becomes what the sanatorium environment already is—friendly, encouraging and entirely undemanding. I can only mention in passing that I saw several cases that underscored, and almost caricatured, the significance of these factors. Two such cases (not here reported) would almost certainly have been schizophrenic if they had lived in the outer world, but they had been able to make an adjustment within the sanatorium by using their severe tuberculosis to guarantee care and affection for themselves. Both of these patients seemed to pay scant attention to their disease, but somehow or other, managed to be the

most discussed therapeutic problems in the sanatorium. They bought their peace dearly—almost, one might say, at the expense of their lives.

SUMMARY

A brief review of the divergent views in the literature of the past few decades indicates the need for further documentation of the relationship between personality conflicts and pulmonary tuberculosis. Three cases are described which indicate that an individual may react to life situations with an anxiety state or other personal behavior in such a way as to interfere with healthy living; and these reactions may thereby become a most significant factor in the onset and course of clinical tuberculosis. The *individualistic* character of these personality reactions does not encourage one to expect valid *general* formulations for the direct correlation of personality traits with tuberculosis infection. In addition, a special limitation to extensive statistical study of such correlations is clearly seen:—the "official" case history usually misses the more significant personal issues, and these come to light only in personal relationships or in special personal types of psychiatric study. In terms of practical management, pulmonary tuberculosis can be as much a disease of the personality as it is of the lungs.

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THE PARALLELISM IN CHANGES OF SENSORY FUNCTION AND ELECTROENCEPHALOGRAM IN ANOXIA AND THE EFFECT OF HYPERCAPNIA UNDER THESE CONDITIONS*

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Numerous investigations have shown that anoxia causes a diminution in the sensitivity of various sensory functions which is roughly parallel to the degree and duration of the anoxia (cf. Gellhorn and Hailman, 1943). However, the interpretation of these findings is not certain. It has been claimed (Kyrieleis, Kyrieleis and Siegert) that inability to concentrate one's attention on the task at hand is responsible for the rise in sensory threshold whereas others believe that the effect of anoxia on sensory function is due to its action on the various neurons involved in this particular process. The simultaneous recording of subjective sensory changes as well as of objective changes in the activity of the respective part of the cortex allows one to decide this question. The determination of the critical fusion frequency (CFF) of vision under control conditions and during anoxia serves as an indicator of sensory changes whereas the recording of the electroencephalogram (EEG) from the occipital lobes is used as a measure of the anoxic effects on the central nervous structures involved in vision.

It has been shown in several papers by the senior author (E. G.) that the inhalation of 3% CO_2 combats the effects of anoxia as far as sensory and so-called "psychic" functions (associations, memory) are concerned. This effect has been attributed to the respiratory stimulation which raises alveolar oxygen tension as well as to an improvement in brain circulation. Since thus far no evidence has been presented that carbon dioxide offsets the effects of anoxia on the objective signs which accompany the activity of the central nervous system, a study of the action of varying degrees of anoxia with and without carbon dioxide on a sensory function and the EEG was undertaken.

METHOD

After numerous preliminary experiments, the main set of observations was obtained from five experimental subjects (medical students of 20 to 25 years of age). The EEG was recorded from the occipital lobes. The CFF was determined by means of a neon tube in direct vision. The observations were made monocularly with an artificial pupil, the visual field being 2 degrees. Gas mixtures were inhaled from Douglas bags and were prepared as in earlier publications.

RESULTS

I. The parallelism between changes in CFF and EEG in anoxia

Figures 1a, 1b, 1c and 2a, 2b, convincingly illustrate the fact that parallel changes occur in the CFF and in the occipital EEG under conditions of anoxia. The CFF declines in proportion to the degree of anoxia and the sensitivity of the individual. In every instance, it was observed that when a significant decline in CFF had taken place there were simultaneous changes in the EEG. Similarly it was found that when, on readmission of air, the CFF rose to its original level, the EEG reappeared in its normal pattern.

Figure 1a shows that during the inhalation of 8.4% O_2 there is only a very slight decrease in CFF which is of doubtful significance. Simultaneous recording of the EEG shows that the brain waves are practically unchanged at this time (B). However, changes in the occipital lobes are apparent when the effect of object fixation[1] is tested. Under control conditions (A), the alpha waves disappear almost completely while an object is fixated with open eyes. However, a burst of alpha waves appears in undiminished amplitude in spite of this fixation during anoxia as seen in record B. When the degree of anoxia is aggravated by inhalation of 7.8% O_2, the CFF declines more and at this time large delta potentials appear and the alpha potentials are present at a reduced amplitude. On opening of the eyes, some reduction in delta potentials is seen, which leads to a more conspicuous appearance of the alpha potentials of reduced size. When air has been readmitted, there is a gradual rise in the CFF and similarly it is found

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[1]Opening of the eyes and fixation of a printed word.

that the delta potentials disappear. After a few minutes a normal EEG record is obtained which shows on eye opening a normal disappearance of the alpha potential.

Figure 1b is of interest because due to the presence of carbon dioxide 7.6% O_2 had no effect on the CFF. Similarly, it was found that no changes in the EEG took place during anoxia. The effect of object fixation was likewise unaltered under these conditions.

subject. When the subject inhaled the gas mixture for five minutes there were not yet any conspicuous changes in CFF and likewise the EEG was unchanged (Record B). However, some minutes later (C), the alpha waves had practically disappeared, large delta waves were present, and no change occurred in the EEG on object fixation. At this time the CFF was lowered greatly. When air was readmitted, the cortical potentials were extremely low, but following a period of object

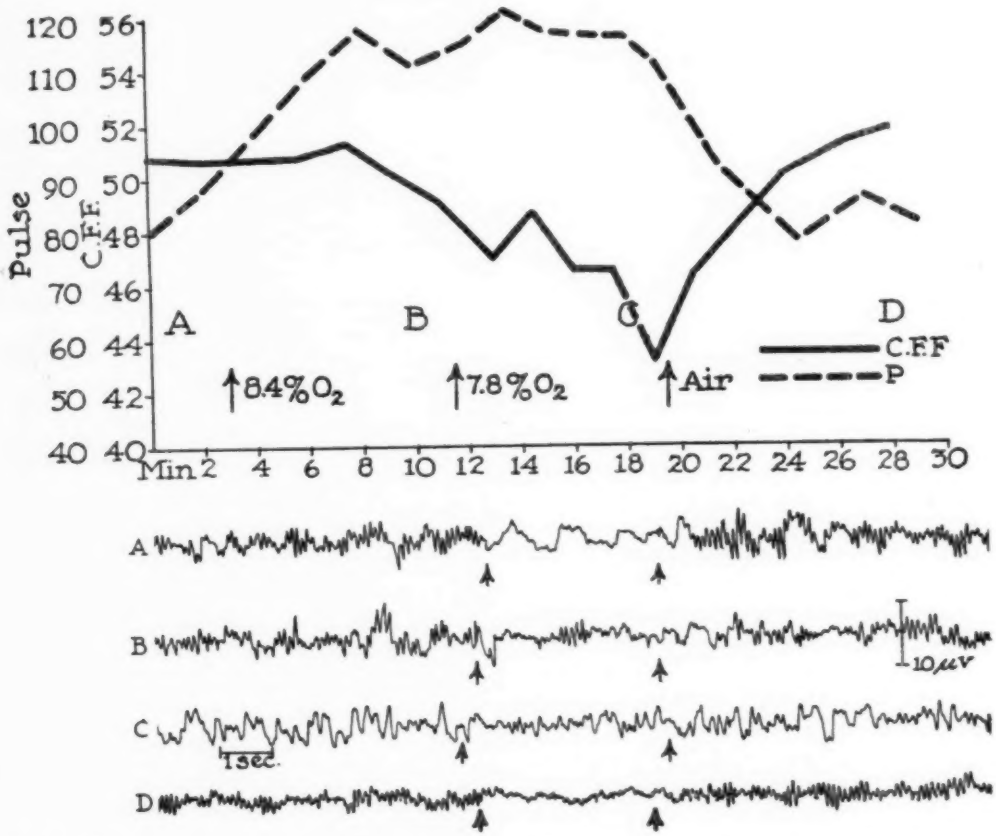

FIG. 1a. Effect of 8.4 and 7.8% O_2 on critical visual fusion frequency (CFF), pulse rate (P), and electroencephalogram (EEG). Subject Mo

The effect of a very severe anoxia (6.2% O_2) on CFF and EEG in the presence of CO_2 is reproduced in figure 1c. It was found that the CFF gradually declined to very low levels. During this time, alpha potentials persisted but some delta waves appeared also. The changes are not so marked as in the experiment 1a, although they are conspicuous when compared with the control record D obtained after readmission of air.

Figure 2a shows the effect of 8.4% O_2 on another

fixation, normal alpha waves reappeared. A few minutes later, both CFF and EEG were normal. Figure 2b shows that during anoxia in the presence of CO_2 the EEG record of the same subject remained normal; under these conditions significant changes in the CFF were likewise absent.

Additional observations gave further evidence for the parallelism between changes in CFF and EEG. One of our subjects was in a state of great apprehension after the mask had been put on.

The experiment had to be interrupted when the subject had inhaled 8.4% O_2 for only three minutes. At that time the pulse rate had dropped to about half of the original rate and profuse sweating was in evidence. In spite of these considerable autonomic changes, neither the EEG nor the CFF were altered.

It has been emphasized that in anoxia the changes in CFF and EEG are parallel. However, it should be added that minor incongruities occur. anoxia on various functions was studied in the presence and absence of 3% CO_2. It is obvious from the records that carbon dioxide may offset completely or greatly diminish the general symptoms of anoxia. Thus, subject S, who observed photisms during inhalation of 7.8% O_2 did not show any of these symptoms when a slightly lower oxygen concentration (7% O_2) was inhaled in the presence of 3% CO_2. Only on further lowering of the oxygen concentration to 6.2% did photisms

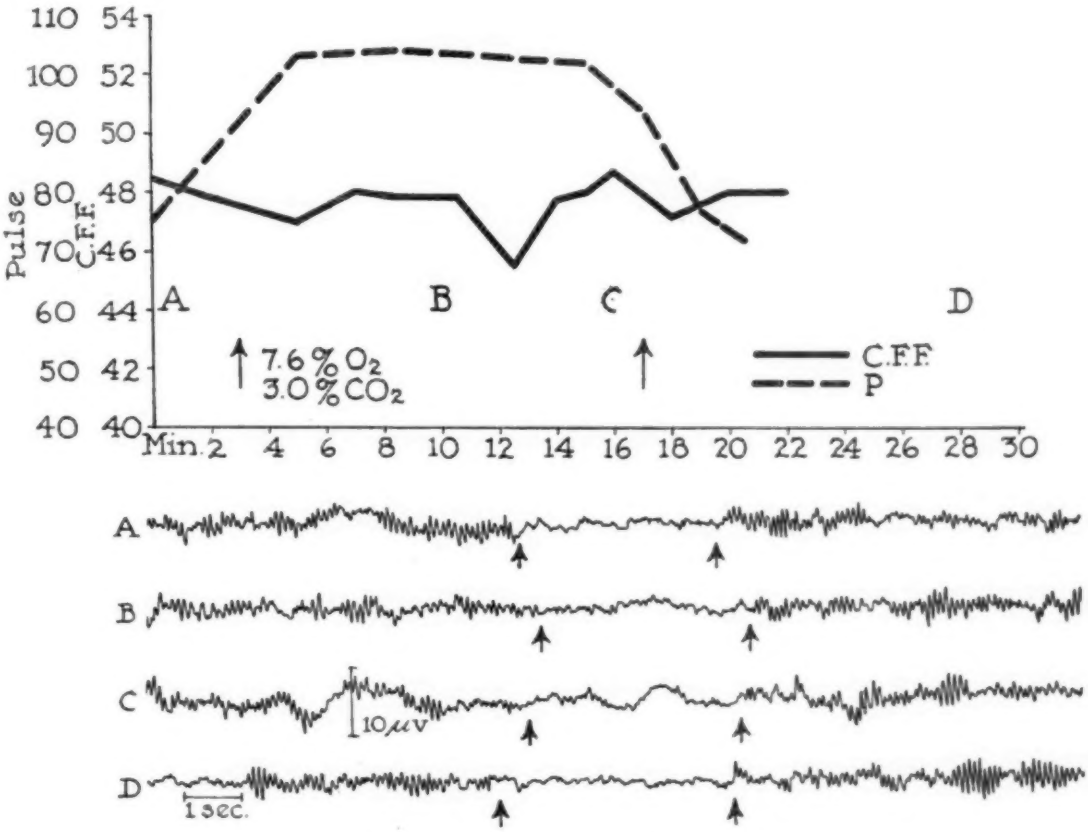

FIG. 1b. Effect of 7.6% O_2 plus 3% CO_2 on CFF, P, and EEG. Subject Mo

Thus with a relatively mild degree of anoxia, a person may show some fall in CFF without any detectable changes in EEG while others may show slight changes in EEG which are not accompanied by a significant drop in the CFF.

II. The effect of carbon dioxide on the action of anoxia on a sensory function and on central nervous activity

Table I gives the survey of data obtained from five experimental subjects on whom the effect of occur in the presence of 3% carbon dioxide, but even then they appeared to be milder than in the absence of CO_2. This effect is truly remarkable in the cases of the subjects Mc, Mo, and S in whom 6% O_2, in the presence of 3% CO_2, could be tolerated for a considerable period of time with very slight symptoms, although this oxygen concentration invariably leads to loss of consciousness in an even shorter period if no carbon dioxide is present. The Table further demonstrates only a slight and often insignificant fall in the flicker frequency in

the presence of CO_2 in spite of a lower oxygen concentration than was used in the corresponding control experiment in which an oxygen-nitrogen mixture free from CO_2 was inhaled. Likewise, it was found that the effects on the EEG of anoxia were efficiently counteracted by simultaneous inhalation of 3% CO_2. Thus it is shown in figure 1b that the inhalation of 7.6% oxygen plus 3% carbon dioxide does not lead to any changes in the EEG and CFF, although the inhalation of 7.8% oxygen for a shorter period causes a great reduction in the amplitude of the alpha waves and the appearance of large delta waves. Even the further reduction of the oxygen concentration to 6.2% causes, in the presence of CO_2, only very slight changes in the EEG (fig. 1c) which are definitely milder than those observed in the control experiment in which at first 8.4% oxygen and later 7.8% oxygen was inhaled.[2]

Another illustration of the fact that the action of anoxia is greatly diminished by simultaneous inhalation of 3% CO_2 is given in figures 2a and 2b. Both records were obtained from the same subject and show very plainly that 6% oxygen does not cause any change in the EEG and only a very slight fall in the CFF in the presence of 3% CO_2 whereas a much higher concentration of O_2 (8.4%) causes an abrupt fall in CFF and an almost complete disappearance of alpha waves and their replacement by large delta potentials. The severity of these central nervous changes is emphasized by the fact that an almost complete cortical silence appeared in this experiment for a short period after readmission of air; only following a period of object fixation did the alpha potentials reappear.

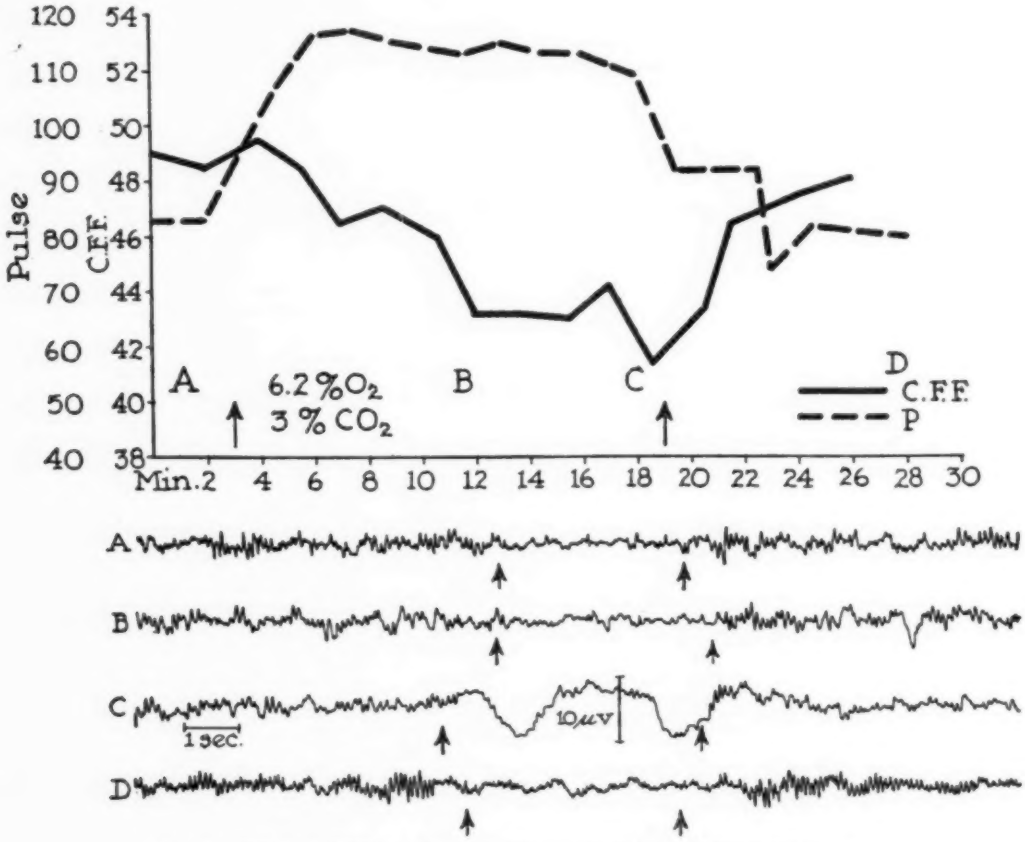

FIG. 1c. Effect of 6.2% O_2 plus 3% CO_2 on CFF, P, and EEG, Subject Mo

A comparison of the pulse rate changes in figures 1a, 1b, 1c and 2a, 2b under conditions of anoxia indicates that the simultaneous inhalation of carbon dioxide has a decisive effect on the rise in pulse rate observed in anoxia. More detailed information will be obtained from Table II. It is

[2]The large sways in the base line of record C in figure 1c are probably due to muscular potentials (eye muscles).

shown that inhalation of 8.4% oxygen causes a very marked increaes in pulse rate whereas inhalation of 7.6 and, in some instances, even of 6.2 oxygen in the presence of 3% CO_2 causes only a moderate increase in pulse rate. Experiments performed on Mo show that the rise in pulse rate observed when 8.4 and 7.8% oxygen are inhaled is much greater than when 7.6% oxygen is administered in the presence of 3% CO_2. Only when the oxygen concentration is lowered to 6.2% oxygen does the pulse rate rise even in the presence of carbon dioxide to approximately the same level as is observed in 8.4% and 7.8% oxygen in the absence of carbon dioxide. Still greater differences appear in the records of Mc which show that the increase in pulse rate during inhalation of 8.4% oxygen is greater than in an experiment in which 6.2% oxygen plus 3% carbon dioxide were used. There is, however, a definite limit for this action of carbon dioxide under conditions of anoxia. When the oxygen concentration is lowered to 5%, the pulse rate rises to nearly maximal values and severe symptoms of oxygen deficiency occur even in the presence of 3% carbon dioxide (Table II).

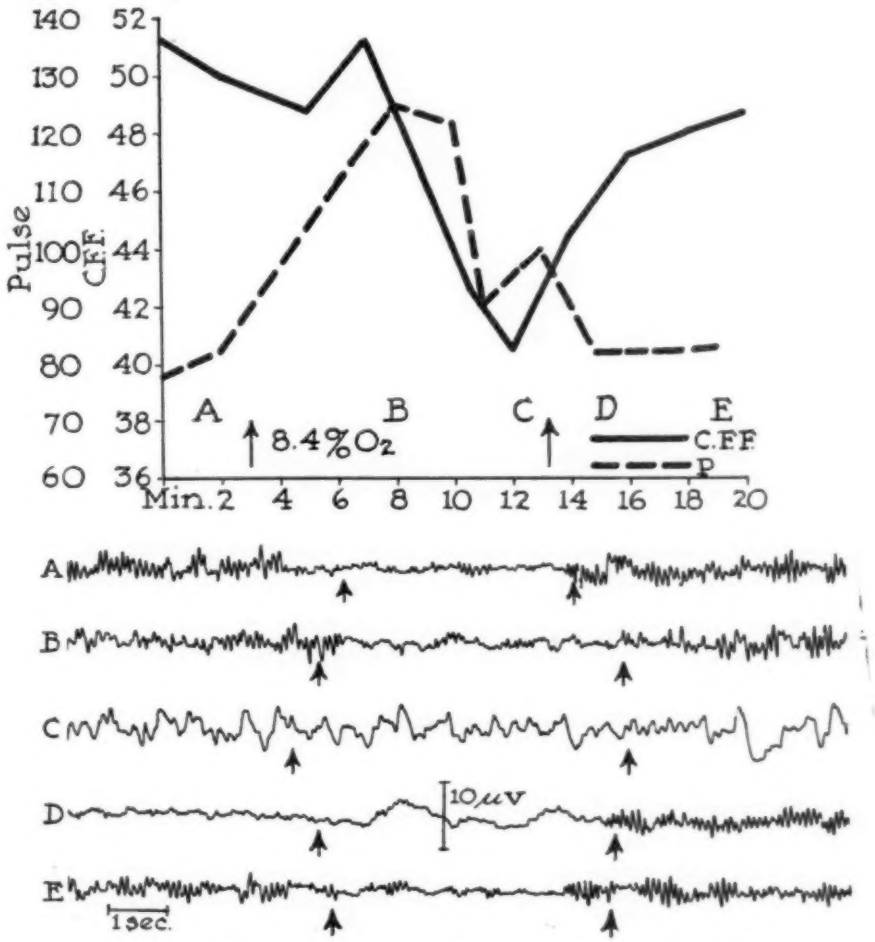

FIG. 2a. Effect of 8.4% O_2 on CFF, P, and EEG. Subject Mc

DISCUSSION

The main phenomenon brought out by the present investigation is the fact that under a variety of conditions involving anoxia there is a parallelism between the subjective sensory changes as measured by the CFF and the objective neuronic changes occurring in the occipital lobes as determined by the EEG. Apparently, the loss in sensory function observed in anoxia is not due to those ill-defined functions of the central nervous system which may be the basis of attention, but seems to be the result of an impairment in the functioning of the retino-geniculate-striate system

since visual functions are impaired only when changes in the EEG occur at the same time. This interpretation is in line with the argument presented by Seitz who observed that the fall in CFF in anoxia can be prevented by local administration of strychnine. He, therefore, assumes that anoxia acts on the retinal neurons rather than on the retinal photo-chemical system. In the light of our own work, these experiments suggest that moderate changes in the geniculate-striate system occurring in anoxia may be offset if the discharge from retinal neurons is increased by means of strychnine.

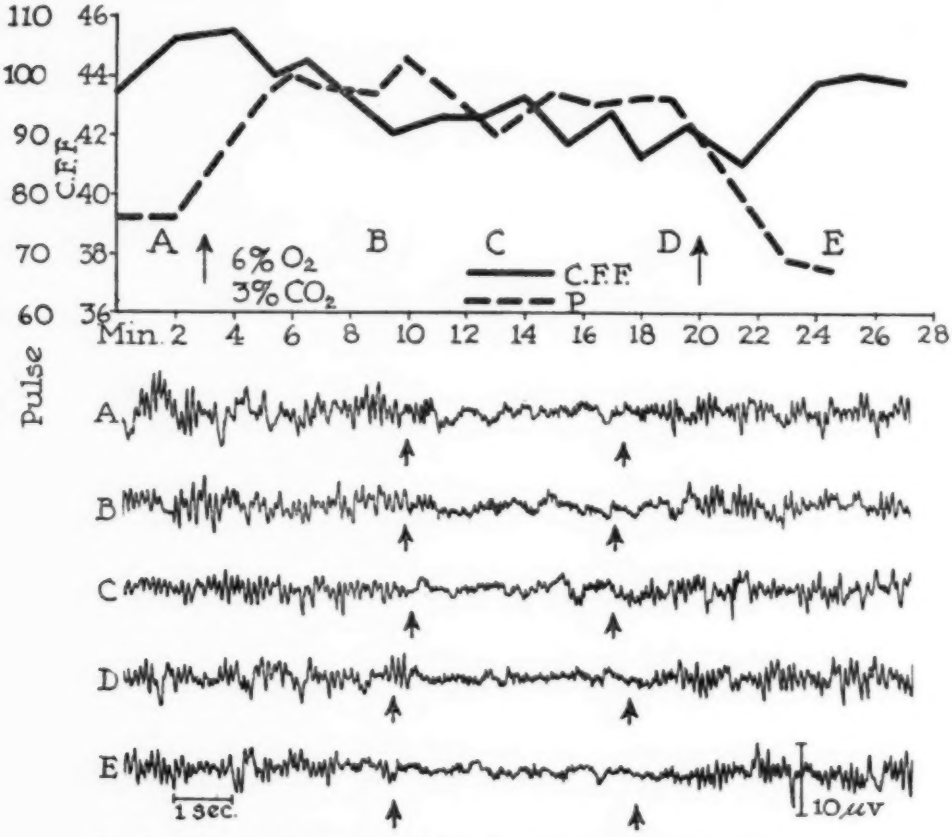

FIG. 2b. Effect of 6% O_2 plus 3% CO_2 on CFF, P, and EEG. Subject Mc

The comparative study of the effects of anoxia with and without the inhalation of carbon dioxide furnishes further material to illustrate the parallelism between subjective changes (fall in the CFF) and objective alterations in central nervous activity (EEG). It could be shown that considerable degrees of anoxia can be tolerated in the presence of 3% CO_2 without any change in the EEG record. In these cases, no significant changes in the CFF were seen. If still lower oxygen concentrations were inhaled in the presence of 3% CO_2 the EEG showed records typical for anoxia. In these cases, a decline of the CFF was likewise observed. Summarizing the present and our earlier work (1, 2, 3) on the effect of the inhalation of CO_2 under conditions of anoxia it may be said that CO_2 offsets not only the subjective sensory changes but also the objective alterations in the function of the cortical neurons as shown by the study of the EEG. Moreover, carbon dioxide likewise counteracts the effects of anoxia on those higher functions of the central nervous system (memory, associations) whose physiological basis is still inadequately known.

Our investigations have shown that CO_2 counteracts anoxia to surprising degree. Not only can the effects of milder degrees of anoxia (slight dizziness, perspiration, and rise in threshold of various sensory functions) which are encountered

when 8 to 8½% oxygen is inhaled be offset completely, but in some instances an oxygen concentration as low as 6%, which ordinarily leads to a loss of consciousness in two or three minutes, may be tolerated without symptoms for as long as eight minutes. These investigations show clearly how much the effects of anoxia are aggravated by a simultaneously developing acapnia. The reason for this action is, in our opinion, to a very large extent circulatory since the relatively severe degrees of anoxia employed in the present series lead to a marked increase in alveolar ventilation which will hardly be increased significantly if 3% carbon dioxide is inhaled at the same time.[3]

SUMMARY

Experiments are reported in which the electroencephalogram (EEG), the critical visual fusion frequency (CFF), and the pulse rate were recorded in five subjects under anoxia and under control conditions in order to determine whether any correlation exists between the subjective sensory

TABLE I

Subject	Gas Mixture	Duration of Anoxia	Maximum Decreases	Maximum Pulse Rate/Min.	E.E.G.	Symptoms
		minutes	*C. F. F. flashes per second*			
Mc 2/24	8.4% O_2	10¼	9	125	Delta	Dyspnea, sleepiness, darkening of visual field
Mc 4/10	7.6% O_2 3% CO_2	10	4	103	Alpha	No sympt.
Mc 4/30	6% O_2+ 3% CO_2	17	4	103	Alpha	No sympt.
Mo 3/5	8.4% O_2	8½			Alpha + delta	Not recorded
	7.8% O_2	8	8	122		
Mo 4/9	7.6% O_2+ 3% CO_2	14	3	104	Alpha + small delta	No sympt.
Mo 5/7	6.2% O_2+ 3% CO_2	15¾	7	117	Alpha + small delta	No sympt.
S 3/6	8.4% O_2	6			Alpha + delta	Saw flashing lights
	7.8% O_2	7¼	10	97		
S 5/4	7% O_2+ 3% CO_2	12½	8	83	Alpha plus occasional delta	No sympt.
S 5/7	6.2% O_2+ 3% CO_2	7¼	8	121	Alpha + delta	Saw less of flashing lights
B 5/28	8.4% O_2	14¾	10	111	Alpha + delta	Felt warm, dizzy, vision darker, sleepy
B 6/2	7.5% O_2+ 3% CO_2	14	5	101	Alpha + delta	None
Mos 2/26	8.4% O_2	9	6	113	Increased amplitude of E.E.G. alpha + delta	Tingling hands, light seems darker
Mos 5/12	7% O_2+ 3% CO_2	11	1	118	Increased amplitude of E.E.G. alpha + delta	Not recorded

[3]It is easily understandable that McFarland (7) observed a marked increase in alveolar O_2-tension in the presence of 3% CO_2 when 11% O_2 was inhaled since with such mild degrees of anoxia the respiratory volume per breath is either unchanged or only slightly increased if the oxygen-nitrogen mixture is inhaled without additional carbon dioxide. For a further discussion of the effect of CO_2 in anoxia see (4).

changes observed in anoxia and the activity of the brain as recorded by the EEG.

It is shown that conditions of anoxia leading to a decline in CFF are accompanied by typical anoxic changes in the brain as demonstrated by the EEG. Degrees of anoxia which do not alter the CFF significantly have no effect on the EEG. The experiments suggest that the subjective changes in visual functions observed in anoxia are not due to ill-defined psychic factors such as lack of attention or lack of cooperation but are due to an actual impairment of the neurons of the retino-geniculate-striate system.

Addition of 3% carbon dioxide to oxygen-nitrogen mixtures greatly alleviates or completely offsets the effects of anoxia. This holds true not only for the general symptoms (dizziness, perspiration, general discomfort, etc.), but also for the effects of anoxia on the CFF, and EEG. Under the conditions of these experiments there is likewise a parallelism between subjective (sensory) and objective (EEG) changes. The mechanism involved is discussed and the fact is emphasized that the pulse rate rises more when oxygen-nitrogen mixtures are inhaled than when similar oxygen-nitrogen mixtures are used to which 3% carbon dioxide had been added.

TABLE II

Effect of low oxygen concentrations with and without CO_2 on pulse rate

Subj.	C^1*	Pulse rate/min. during anoxia	C^2†	Gas mixture used
Mo	84	108(3)‡ 118(5) 115(11) *122*(13) 117(14) 116(17) 111(18)	92(2) 78(3)	8.4% O_2 during 1st to 8th min.; 7.8% O_2 from 8th to 16th min.
Mo	75	103(2) *104*(7) 103(10) 102(12)	94(1) 77(2) 72(4)	7.6% O_2 + 3% CO_2 for 14 min.
Mo	83	116(3) *117*(5) 115(10) 113(13) 109(15)	92(2) 74(3)	6.2% + 3% CO_2 for 16 min.
Mo	85	115(1) *137*(3)	101(1)	5% O_2 + 3% CO_2 for 4 min.
Mc	81	111(3) *125*(5) 100(10)	82(2)	8.4% O_2 for 10 min.
Mc	77	98(4) 95(7) *103*(10) 94(14)	73(2)	7.6% O_2 + 3% CO_2 for 20 min.
Mc	71	100(3) *103*(7) 97(12) 96(17)	69(3)	6.2% O_2 + 3% CO_2 for 17 min.
Mc	78	113(2) *145*(4)	86(1) 70(6)	5% O_2 + 3% CO_2 for 4 min.

* C^1 = Pulse rate before anoxia.

† C^2 = Pulse rate after readmission of air.

‡ The figures in () refer to the time in min. after the onset of anoxia and the readmission of air respectively.

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ELECTROENCEPHALOGRAPHIC STUDIES IN ASTHMA WITH SOME PERSONALITY CORRELATES*

SIDNEY RUBIN, M.D.,† AND LEON MOSES, M.D.†

INTRODUCTION AND DEVELOPMENT OF PROBLEM

This paper constitutes a continuation of an effort started some time ago to study objectively disease entities which demonstrate the inter-action of psychic and somatic factors. Bronchial asthma seems to lend itself ideally to such a study. In this connection the statement of Haiman (12) would seem to be of interest. He says,

"... it seems clear that a neurotic predisposition underlies many cases of asthma, just as it does numerous other conditions.

"Psychic and emotional disturbances play an important part in asthma. Normal respiration is maintained by the smooth physiologic functioning of the vegetative nervous system, and respiratory movements usually ... are carried out automatically without the intervention of voluntary processes. To a limited extent, however, the central nervous system does influence respiration and this effort undoubtedly is mediated through the diencephalon which serves as a coordinating mechanism for voluntary and involuntary processes."

Hansen (15) maintains that his aim is to show that such diseases (asthma), the incitement of which is manifestly subject to pathogenic physical components, are also absolutely dependent in their cause, even in their origin, on special psychical influences acting on the patient.

Psychiatric considerations of asthma have been undertaken by a number of writers. Gillespie (11) writes that asthma seems to be in part a disturbance of the vago-sympathetic balance which is most influenced by emotional states. He believes that asthma may be the expression of a state of uneasiness or mental conflict, a means of escape or a desire for sympathy. McDermott and Cobb (18) state that it is common knowledge that asthmatic patients are "nervous" and the older writers accepted the fact as self-evident. In their study they found that 30 patients out of a total of 50 gave a convincing history of emotional factors in their asthma.

In discussing asthma in children, Clarkson (2) states that a failure of adaptation or a tendency to false compensation will enhance a potential overflow into autonomic channels, but emotion can rarely pervert the machinery of the lower centers until something of a purely physical nature impairs the integrity of cortico-thalamic control. However, the prespastic emotional life constitutes the basis for later disorder, for from its constituent elements may be eventually forged the dynamic energy of psycho-autonomic activity.

Bray (1) regarded the psychic trauma in asthma as the trigger that fired the already loaded allergic gun, and considered that psychological treatment might help the patient suffering from allergic disorders by attending to his personal difficulties or environmental stresses. Zeigler and Elliott (23), Strauss (22), and Hall (13) express similar points of view.

The psychoanalytic school has made significant contributions to the personality constellations in asthma. In this connection Deutsch (6) feels that there is always present a distinct emotional reaction to the environment; great dependence on, combined with hatred of a domineering and aggressive mother, and a tender attachment to a more or less easy-going father, with a rather passive personality or with behavior overcompensating this passivity. Fenichel (8) writes that although the specific position of asthma in a system of the neuroses has not been expressly formulated as yet, one finds that "... the behavior of the asthmatic apart from his asthmatic symptomatology, is that of a compulsive neurotic, or even of an individual suffering from a narcissistic neurosis (ambivalence, bisexuality, sexualization of thought and speech, character anomalies)."

An outstanding monograph on psychogenic factors in bronchial asthma has been compiled by French and Alexander (9). They state that asthmatic attacks tend to be precipitated by situations that threaten to separate the patient from some mother figure. The separation feared may be actual physical separation; more frequently it

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is the danger of estrangement from the parental figure due to some temptation to which the patient is exposed. In such a situation the asthma attack seems to have the significance of a suppressed cry.

The personalities of the patients have one common feature. They all suffer from a deep-seated insecurity and a more or less intense need for parental love and protection. It would seem that the urge to aggressive mastery of the environment and the urge to self-sufficiency and independence which are so important for normal personality development are in these patients largely absorbed in the task of mastering the fear of being left alone.

It is of interest to note that a number of writers have observed a connection between asthma and the depressive states and the major psychoses. Reichmann (19) states that bronchial asthma is a neurosis of the respiratory tract, a part manifestation of a general psychopathic constitution. Manic-depressive swings are of special frequency in asthmatics. According to Hansen (14) not infrequently certain asthmatics show to a more or less marked degree, symptoms of manic-depressive disease, and the asthmatic attacks predominate in attacks of depression.

In a foot-note, Dunbar (7) states that the connection between manic-depressive disease and asthma has impressed a number of observers. That there is a definite inter-relationship between manic-depressive disease and asthma on the one hand and a definite psycho-pathological development on the other, has been shown by psychoanalysis. "The possibility (is) that both phenomena, manic-depressive attack and asthma are different expressions, one more psychic, the other more somatic of the same underlying psychic constellation." In a survey of over eleven thousand patients with functional psychoses, Leavitt (16) found the incidence of asthma highest in manic-depressive states.

That there was a relationship between the human electroencephalogram and psychological characteristics was noted early in electroencephalographic work by Lemere (17). He stated in 1936 that the ability to produce "good" alpha waves seems to be a neuro-physiological characteristic which is related in some way to the affective capacity of the individual. Mildly manic or depressed patients give a "good" Berger rhythm provided there are no presenile or arteriosclerotic changes or signs of mental deterioration.

Gallagher, Gibbs and Gibbs (10) state that a relationship exists between the electrical activity of the cortex and personality. Saul, Davis and Davis, (21), and Davis (4) found that a high alpha index is characteristically associated with a passive dependent receptive attitude towards other persons, provided this attitude is freely accepted and not thwarted or inhibited internally. Low alpha indices were usually associated with a consistent, well-directed, freely indulged drive to activity. Rubin and Bowman (20) noted the same general EEG and personality correlates in peptic ulcer patients.

With the factors in mind, then, of (1) a rather definite personality constellation postulated in bronchial asthma, and (2) the apparent relation between alpha index and personality, it was felt that an EEG study of bronchial asthma patients from the point of view of alpha index and personality data would be of distinct value in the critical evaluation of the validity of these findings.

PROCEDURE AND TECHNIQUES

The electroencephalographic and personality data which follow were derived from a study of forty-five males selected only for their asthma by history, physical findings, sensitivity tests, and chest X-rays. It should be noted that the majority of this group came from a pay clinic and were, therefore, of a somewhat better than marginal income group. They had all been referred to the clinic because of their allergic and asthmatic complaints.

The records were taken in a room which was dimmed only by having the shades drawn. There was no talking while the records were being taken, but the ordinary hum of general hospital activity was audible to the patient. The apparatus and technician were in the same room as the patient during the run. While the record was being taken the subject was lying quietly on a comfortable couch, awake, but with eyes closed.

The procedure and apparatus were explained to the patient before the run and every effort made to place the patient at ease and in an unapprehensive, emotional attitude. Electrodes were placed over the occiput, vertex and frontal areas bilaterally. The occipital electrodes were placed about 2 cm. above the external occipital protuberance and about 4 cm. out from the mid-line at this point. The vertex leads were placed about 6 cm. out from the mid-line, and the frontal leads were about 1 cm. below the hair line or its approximation and about 4 cm. out from the mid-line. These points were arbitrarily selected and no rigid effort at iden-

tical placement was attempted. The electrodes were small solder pellets held in place with collodion and good electrical contact was established with electrode paste (Sandborn). The indifferent electrode placement was on the ear lobes.

The instrument used for this study was a six-challen ink-writing occilograph with its amplifiers and broad band filters built by Mr. Albert M. Grass. The records were taken with tuned filters having a broad peak at 10 cycles per second in the circuit. The recorded frequencies are linear up to 50 cycles per second, at which point they are cut out deliberately by a "muscle filter," so that extraneous muscle potentials and electrical disturbances are eliminated.

Monopolar and bipolar routine records were run on each patient, but for the purposes of this study only the monopolar occipital records generally were studied. The sample selected for the alpha index determination was the best 100 cms. (machine speed—3 cms. per second) in a two-minute run. The lowest amplitude counted was 7 to 10 microvolts and the alpha waves had to occur in sequences of at least 3 to be counted. Runs were made with eyes open and closed to determine the "eyes open" and "eyes closed" effect on the alpha rhythm.

RESULTS

The general protocols are given in Tables I and II.

Electroencephalographic Data

The distribution of the alpha indices of the forty-five cases studied are plotted in Figure 1A. Figure 1B shows our data and that of H. Davis (3) (group of 100 instructors at Pensacola Airfield, average range "for the most part not over 30," no filter, monopolar occipital leads) broken up according to the classification of rare, mixed, subdominant and dominant alpha activity.[1]

In the breakdown of our cases by decades (Table III), it will be noted that the great majority of cases are found in the decades up to 40 years of age. We do not feel that the difference in age range noted between our group and the normal group is of sufficient significance to make them incomparable from the point of view of alpha index. If anything, our slightly older age group would tend to give lower alpha indices than the age range used for the normal group.

The distribution of the normal, questionable, and abnormal records is shown in Table IV. The abnormal records are distributed practically all through the entire alpha range although the number of cases here is too small to be of any real significance. In determining the normality of these records, it should be noted that only one record was taken of each patient. The ordinary criteria of stability of voltage, constancy of pattern, etc. were used in evaluating the records.

Our distribution of alpha indices (Table V) would seem to differ from the normal distribution (Figure 1B) as follows:

1. The curve is apparently unimodal in character, showing a peak skewed far over into the dominant alpha range. The findings of 60 per cent of our cases showing a dominant alpha index (75–100 per cent, in contrast to the normal group showing 20 per cent of cases with a dominant alpha index, would seem to establish the thesis that the asthmatic cases studied have a significantly greater

[1] After the final revision of this paper had been made, we received the following data on alpha indices from Dr. Hallowell Davis (3a) based on a series of 976 aviation cadets studied by him at the Naval Training School at Pensacola. Permission for the use of this material and the material on the 100 instructors has been granted by the National Research Council Committee on Selection and Training of Aircraft Pilots.

Davis states, "The students are all young men not over 25 who had passed the very rigorous physical examination required by Naval Aviation. All of them had also completed at least 2 years of college. They had also passed the preliminary screening at the elimination bases. It would be hard to find a more carefully selected group of superior young men."

Alpha Index—Pensacola Series

Alpha index*	Number	Per cent
0–9	92	9.4
10–19	54	5.5
20–29	50	5.1
30–39	65	6.7
40–49	89	9.1
50–59	121	12.4
60–69	111	11.4
70–79	133	13.6
80–89	188	19.3
90–100	70	7.2
Record technically inadequate	3	0.3
Total	976	100.0

* When left and right Alpha Indices differ, the average age of L. and R. is used. No electrical filtration used.

tendency to show high alpha indices than do the normal group. The expectancy, therefore, of a dominant alpha index in bronchial asthma cases is three to one as compared with non-asthmatic patients.

2. The sharp skewing of the curve with 85 per cent of our cases showing an alpha index of over 50 per cent (Table V) would seem to indicate that we are dealing, from the point of view of their alpha indices, with a practically homogeneous group. A possible explanation of the presence of cases in the mixed and rare alpha group will be considered under personality data.

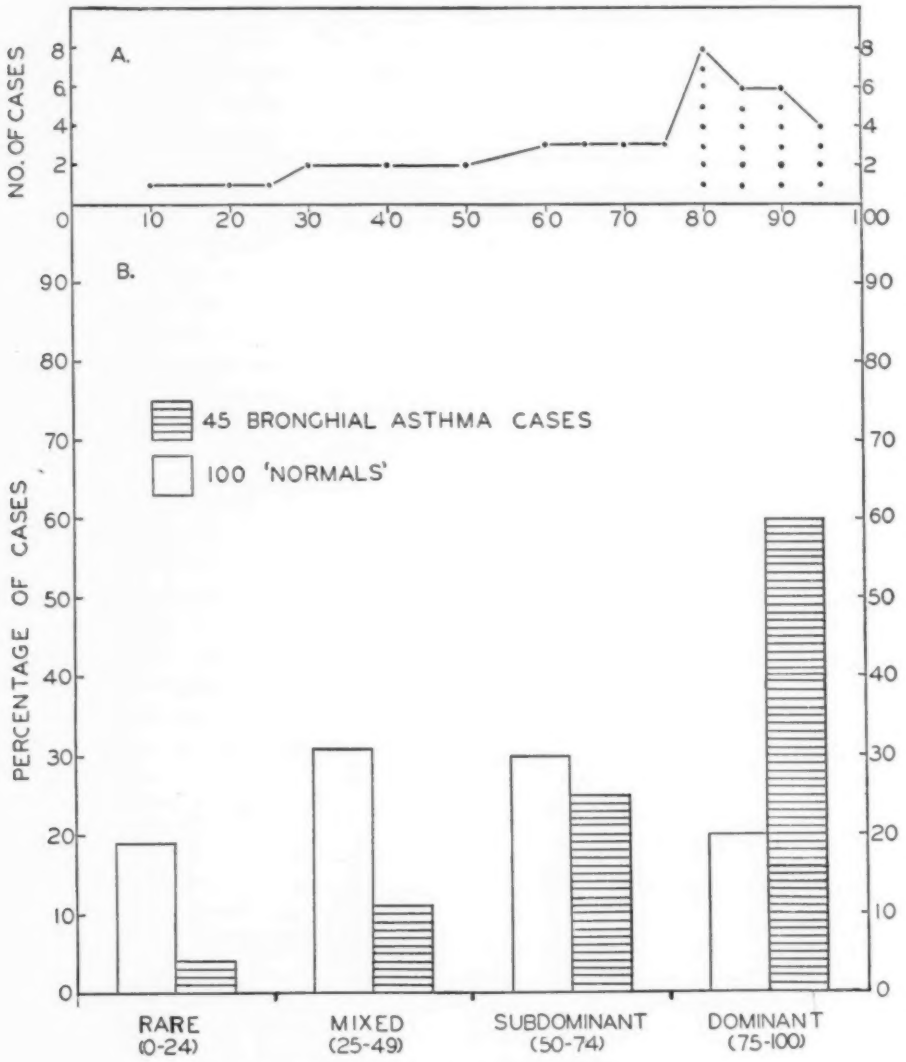

FIG. 1A. Alpha indices of 45 bronchial asthma cases.

FIG. 1B. This series of "normals" is a group of 100 instructors at the Pensacola Air Field. Their age was "for the most part not over 30." No filter. Monopolar occipital lead. Permission for the use of this material granted by the National Research Council Committee on Selection and Training of Aircraft Pilots (H. Davis, 3, 3a).

The average voltages are divided into high, moderate and low. The distribution is shown in Table VI.

The average alpha frequencies are tabulated n! Table VII. It will be noticed that a majority of

TABLE I

45 Male Cases of Bronchial Asthma

Number	Name	Age	EEG data					Asthma data																		Personality data															
			Alpha index	Average frequency #1	Average voltage #2	Normality of EEG #3	Age of onset	Severity #4	Duration	Occurrence #5	Symptoms #6	Nocturnal attacks	Ephinephrine response	Eczema	Hayfever	Familial asthma #7	Associated lung pathology #8	Symptom-free past year	Skin sensitivity (intradermal)				Sibling relationship #9	Father #10	Overprotective mother	Outwardly aggressive	Outwardly calm	Vocational success	Oral activity	Insecure feeling	Early independence #11	Mate desired #12	Emotional precipitant #13
																			Dust	Pollens	Foods	Animals																		
1	J. M.	39	60	10	M	N	29	M	10	P	T	•	•		•	B			•	•			5/7	D	I		•			•	D	
2	A. H.	22	60	10	M	N	2	M	20	P	T	•	•	•		B			•	•	•••		1/2	P	••		•				D	
3	H. S.	45	70	9	M	N	39	S	6	P	T	•	•						•				2/3	P	•		•				P	
4	M. C.	36	40	9	M	Ab	33	M	3	P	T	•	•						•			•	4/4	P	•		•				P	
5	I. G.	33	60	10	—	N	22	M	11	PS	T	•	•						•			••	2/6	I	•		•				P	
6	J. L.	26	20		L	N	12	M	14	P	T	•	•					•	•			•	2/4	I	•		•				D	
7	A. M.	26	65	10	M	N	4	S	22	P	T	•	•							•			1/3	P	•		•				D	
8	V. N.	23	95	11	H	N	18	M	5	PS	T	•	•							•	••		4/4	D	••		•				I	
9	A. S.	19	85	11	M	N	5	S	14	P	T	•	•										1/1	P	•		•				D	
10	L. S.	45	80	9	M	N	41	S	4	P	T	•	•										3/5	P	•		•				D	
11	B. S.	28	80	11	M	N	20	M	8	P	T	•	•										1/1	P	•		•				D	
12	S. S.	23	95	10	H	N	3	S-M	20	P	T	•	•										1/1	P	•		•				D	
13	M. O.	32	95	9	H	N	28	M	4	P	T	•	•	•									1/4	P	•		•				D	
14	J. P.	28	85	10	M	N	4	M	24	Sp	A	•	•		••								2/6	I	•••		•				I	
15	M. E.	37	10		H	N	30	M	7	P	T	•	•										1/3	P	•		•				I	
16	L. B.	22	75	10	H	Ab	7	M	15	P	T	•	•		•								1/1	I	•		•				I	
17	H. K.	20	70	10	M	N	16	M	4	P	T	•	•										1/2	I	••		•				I	
18	F. B.	28	90	10	H	QN	23	M	5	P	T	•	•			M	T						2/3	P	••		•				D	
19	N. M.	40	95	11	H	N	4	S	36	P	T	•	•				T						1/1	D			•				P	
20	J. E.	38	65	8	M	QN	4	S-M	34	P	T	•	•			M							1/1	P	••		•				D	
21	H. H.	16	90	10	M	N	11	M	5	P	T	•	•										2/2	P	••		•				I	
22	J. J.	30	75	9	M	N	21	M-S	9	P	T	•	•			S							7/14	D	••		•				D	
23	A. F.	16	25		M	N	10	M	6	Ps	T	•	•							•			1/2	P	••		•				I	
24	K. R.	26	80	11	M	N	2	S	8	P	T	•	•							•			1/1	D	I		•				I	
25	H. W.	42	85	10	M	QN	13	S	28	P	T	•	•			M							1/1	P	•••		•				D	
26	T. T.	26	80	11	M	N	5	M	18	P	T	•	•			B							1/3	I	•		•				I	
27	G. M.	30	30	11	M	N	2	S-M	28	Sp	T	•	•			FS							2/4	I	I						I	

TABLE II

28	R. R.	25	80	10	M	Ab	2	M	16	Sp	T	•	•	—	—	—	—	••	•	•	•	•	1/1	I	I	—	•	•	—	—	—	I	—
29	S. S.	36	60	10	M	N	34	M	2	P	T	•	•	—	—	—	—	—	•	—	—	—	1/2	P	•	—	•	—	•	•	—	D	•
30	M. S.	30	50	11	M	N	17	M	13	P	T	•	•	—	—	—	—	—	•	—	—	—	1/5	I	•	—	••	—	—	—	—	I	•
31	C. G.	43	90	12	M	N	26	M	17	PS	T	•	•	—	—	—	—	—	•	—	—	—	1/4	P	•	—	•	—	—	•	—	I	•
32	P. P.	32	40	9	M	N	30	M	2	P	T	•	•	—	—	—	—	—	•	—	—	—	5/5	I	I	—	•	—	—	—	—	I	•
33	S. D.	45	65	12	M	N	35	M	10	P	T	•	•	—	—	—	—	—	•	—	—	—	1/2	U	U	—	•	—	—	—	—	U	•
34	F. F.	30	90	12	M	N	28	M	2	S	T	•	•	—	••	—	—	—	•	••	—	—	1/3	U	U	—	•	—	—	—	—	U	•
35	W. B.	29	75	8	M	N	26	M	3	P	T	•	•	••	—	F	—	—	•	—	—	—	1/5	I	••	—	•	•	—	—	•	D	•
36	G. M.	38	85	11	M	N	34	M	4	P	T	•	•	—	—	F	T	—	•	•	•	•	1/1	P	••	•	—	•	•	•	•	D	•
37	N. G.	36	70	11	L	N	26	M	4	P	A	•	•	—	••	—	—	•	•	—	—	—	1/2	P	••	—	••	—	—	•	—	D	•
38	H. L	15	30	10	M	N	2	M	12	P	A	•	•	—	••	—	—	•	•	•	—	—	2/2	I	••	—	••	•	—	—	—	I	•
39	A. L.	17	90	10	H	N	13	M	4	P	T	•	•	—	—	—	—	—	•	•	—	—	1/1	P	•	—	••	•	—	—	•	U	•
40	A. B.	50	80	8	M	N	7	S	43	P	T	•	•	—	—	F	—	—	•	—	••	—	1/13	I	•	—	•	•	—	—	•	D	•
41	G. M.	46	80	12	M	N	40	M	6	P	T	•	•	—	—	—	—	—	•	•	•	—	1/3	I	•	—	•	•	—	—	•	I	•
42	E. N.	15	85	11	M	N	3	M	12	P	T	•	•	—	—	—	—	—	•	—	•	—	2/3	P	•	—	•	—	—	—	—	I	•
43	E. V.	49	85	11	M	N	40	M	9	P	T	•	•	—	—	—	—	—	•	—	—	—	1/3	P	••	—	•	—	—	—	—	I	•
44	M. F.	44	50	9	M	N	42	M	2	Sp	A	—	•	—	—	—	—	—	•	—	—	—	8/8	I	••	—	•	•	—	—	—	I	•
45	J. C.	26	80	9	M	N	14	M	12	P	T	•	•	—	—	F	—	—	•	•	•	•	2/3	P	•	•	—	—	•	•	—	D	•

#1. Average Frequency: cycles/second.
#2. Average Voltage: H—high (over 50 mv); M—moderate (20–50 mv); L–low (10–20 mv).
#3. Normality of EEG: N—normal; AB—abnormal; Q—questionable normal.
#4. Severity: M—moderate (probably not more than one dozen asthmatic attacks per year). S—severe (status asthmaticus and more than one dozen attacks per year).
#5. Occurrence: S—seasonal: P—perennial: sP—primary seasonal, some perennial: Ps—Equal intensity.
#6. Symptoms: T—typical: history of remissions and relapses, perennial and nocturnal attacks, allergic sensitivities and ephinephrine relief; A—atypical: Not all of above.
#7. Familial Asthma: M—mother; F—father; S—sister; B—brother.
#8. T—healed pulmonary tuberculosis.
#9. Sibling Relationship: Position of patient/number of siblings, e.g. 1/3—youngest in family of three.
#10. Father: D—dominant; P—passive and uninterested in patient's upbringing; I—indeterminable; U—undetermined.
#11. Early Independence: Job at early age, away from family, etc.
#12. Mate Desired: D—dominant and self-reliant; P—passive; I—indeterminable; U—undetermined
#13. Emotional Precipitant: Obvious precipitation of asthmatic attack by emotional factors.

TABLE III

Distribution of Asthma Cases by Age

Age range	No. of cases
15–20	7
21–30	19
31–40	11
41–50	8
Total	45

TABLE IV

Normality of EEG of Asthma Cases

Alpha rhythm	Normal records	Questionable records	Abnormal records
Dominant	23	2	2
Subdominant	10	1	
Mixed	4		1
Rare	2		
Total	39	3	3

TABLE V

Alpha Indices of Asthma Cases

Alpha rhythm	Alpha index	No. of cases	Totals	
			Cases	Per cent
Dominant (75–100)	95	5	27	60
	90	6		
	85	6		
	80	8		
	75	3		
Subdominant (50–74)	70	3	11	25
	65	3		
	60	3		
	50	2		
Mixed (25–49)	40	2	5	11
	30	2		
	25	1		
Rare (0–24)	20	1	2	4
	10	1		

TABLE VI

Average Voltage (μ)

Voltage group	No. of cases
High voltage—over 50 μv	8
Moderate voltage—20–50 μv	35
Low voltage—10–20 μv	2

the cases give alpha readings at the lower end of the normal alpha frequency range.

Of interest in connection with the above data is the recent work by Pauline Davis (5) on the EEG in manic-depressive patients. She determined that the majority of patients in the manic-depressive depressed group have A or MS patterns (comparable to our dominant and sub-dominant group), whereas in the manic-depressive manic group the majority have MF patterns (54 per cent) and practically all the remainder (32 per cent) have M and B patterns (comparable to our mixed and rare group).

There is an indication that the manic-depressive depressed patients tend towards activity on the slow side of the alpha frequency range and that the manic-depressive manic group tend towards activity on the fast side, even though there is overlap and spread in the distribution. The manic-depressive depressed as a group appear fundamentally to be the passive, dependent type of individual, whereas the manic-depressive manic group are more likely to be described as active, energetic and independent.

TABLE VII

Average Frequency (cycles per sec.) of Alpha Runs

Frequency	No. of cases
12	4
11	13
10	14
9	8
8	3
No frequency determination made on record with alpha index less than 25	3

It would seem from this present study then that there is a marked similarity between the alpha activity in bronchial asthma and in manic-depressive psychosis depressed type. This would seem to confirm from the point of view of electrophysiology what has previously been determined psychoanalytically, i.e., the manic-depressive depressed attack and asthma are in the words of Dunbar (7) "different expressions—one more psychic, the other more somatic—of the same underlying psychic constellation."

With this in mind, one might speculate with some degree of justification that by studies of this nature we may gradually approach the nodal

point of the interrelationship of psyche and soma. This may eventually postulate a personality organization responding to stimuli, sometime with a somatic and sometime with a psychic symptom, depending on how the personality is organized. What this may mean for psychic prophylaxis and treatment is beyond the scope of this paper.

Asthma Data

The patients used for this study were all males. Their asthmatic status was determined by a typical history extending over at least two years, typical physical signs, and the absence of X-ray evidence of pulmonary pathology other than that which was regarded as secondary to the asthmatic condition. Intradermal sensitivity tests were conducted on all the patients and are tabulated in Table VIII. The intradermal tests routinely used included all

TABLE VIII

Distribution of Cases by Intradermal Allergin Sensitivities and Age of Onset of Asthma

Age of onset	Intradermal Sensitivity	
	Single (dust)	Multiple (Dust plus pollen, food or animals)
1–5	2	11
6–10	1	2
11–20	2	7
21–30	7	4
31–40	5	3
41–50	1	

the common food, physical, pollen and animal allergins. It should be noted that in all our cases allergic responses were elicited. It is our feeling that the so-called infectious, intrinsic asthma cases tend to be eliminated from our group because of the age limits set for our series.

It is of interest to note that the duration of asthma complaints in this series runs from two to forty-three years with the majority of cases falling into the two decades between twenty and forty years of age (Table III). The histories as elicited from the patients and clinic records were typical in 90 per cent of the cases studied (Tables I and II).

Personality Data

The personality data presented should not be considered as valid for statistical analysis in the same sense as the previous data. Material was gathered by interviews with the patients lasting from 45 minutes to one hour. In some cases, information could not be satisfactorily ascertained because of language difficulty, insufficient time to establish adequate rapport, etc.

Despite these factors, in going over our personality material, we have noted certain trends which appear to be of significance. The data has been sub-divided under the following headings: 1) Sibling relationship, 2) Father attitude in the family, 3) Mother attitude in the family, 4) Outward aggressivity of patient, 5) Outward calmness of patient, 6) Vocational success, 7) Oral activity, 8) Insecurity feelings, 9) Early independence of patient, 10) Type of mate desired, 11) Emotional precipitants.

The data on sibling relationship is of some interest from the point of view of the large number of patients who are oldest (or first born) or youngest (over 75 per cent) (Table IX), the so-called vulnerable position in a family constellation.

TABLE IX

Sibling Position of Cases

Position		No. of cases
Oldest Child	Only	11
	First-born	17
Other Positions		11
Youngest Child		6
Total		45

The parental attitude in the family is of interest. In the great majority of cases where this could be obtained, it appeared that many had a dominating, over-protective mother, and a passive, essentially uninfluential father. There is, however, little evidence of early feelings of independence in our patients, despite the fact that the mothers as a group seemed anxious for the patients to develop self-reliance, independence, etc.

Our data furnishes rather striking evidence that we are dealing with people who are essentially a reserved, somewhat withdrawn, outwardly calm group. Over 90 per cent of the entire group failed to show those attitudes ordinarily associated with aggressive strivings and ambition, while only about half have made a vocational success acceptable even to themselves. There is some indication of this from another source. A considerable number of these patients desire a dominant and self-reliant mate, ("I'd like my wife to be able to take care of herself and me when I am sick").

From our data, there is little to indicate any marked oral activity or emotional precipitating factors in relationship to attacks.

Insofar then as this fairly definite personality constellation is related to a high alpha index, it would seem that we are dealing with an approximately 80 per cent homogeneous group. If we could more accurately determine the extrinsic allergic, spastic, bronchial asthmatic, we should get probably even a greater percentage of cases in the sub-dominant and dominant group.

Again it should be emphasized that this material would seem to indicate only tentative conclusions. Much more complete gathering of material is necessary before any statistical validation can be attempted.

SUMMARY

Fifty-four male cases of bronchial asthma have been studied from the point of view of electroencephalographic and personality data.

The electroencephalographic data indicate a definite relationship between bronchial asthma and a dominant alpha record, i.e., about three times as many dominant alpha records were found in the asthmatic group as in a normal group.

Dominant alpha records have been correlated with passive, receptive types of individuals. This has been determined by previous studies, (17, 21).

Our own personality data would seem to indicate that in general we are dealing with a single, fairly definite personality constellation. Our patients appear to be a fundamentally passive dependent group who are the children of an over-protective, dominating mother. They have not cared for, striven for, or gained any marked degree of independence in life and continue to seek care and protection from the environment.

Our results would indicate, therefore, a close relationship between bronchial asthma and a fundamental passive dependent personality structure, by the criterion of high dominant alpha index correlation with established passive personality.

These findings would seem to show the value of this type of study for the better understanding and evaluation of the underlying personality structure and psychic factors in patients with this disease and in psychosomatic problems generally. Some further implications of this study have been pointed out and discussed.

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EFFECTS OF INJURY TO THE CEREBRAL CORTEX UPON SEXUALLY-RECEPTIVE BEHAVIOR IN THE FEMALE RAT[1]

FRANK A. BEACH*

INTRODUCTION

Previous studies have revealed that females of several mammalian species display sexually-receptive behavior after extensive injury to the forebrain. Typical estrous behavior has been observed in female cats following complete removal of the neocortex combined with injury to the rhinencephalon, the basal ganglia and the sensory thalamus (2, 3, 4, 5, 6). Normal mating behavior is shown by female guinea pigs following removal of neocortex, caudate-putamen, hippocampus, septal nuclei and other portions of the forebrain (13). Unilateral hemidecerebration (removal of all central nervous tissue anterior to the mesencephalon), or total decortication fails to eliminate normal mating responses and postcopulatory ovulation in the female rabbit (11). Female rats suffering the loss of more than half of the cerebral cortex are capable of mating with and being impregnated by the male (7, 19). Destruction of nearly all of the neopallium does not disturb the vaginal estrous cycle in the rat, and pseudopregnancy follows stimulation of the cervix in such animals as it does in intact females (12).

Published reports of sexual behavior in brain-operated female rats have been chiefly of the "presence or absence" type (12). There are many kinds of reactions which, although they survive extensive brain injury, are more difficult to elicit after partial decortication (e.g., copulatory responses in the male rat (8)). Still other behavior patterns may function fairly effectively after cortical invasion although close scrutiny reveals that brain injury tends to disrupt the serial nature of the discrete responses which are smoothly integrated in the performance of the unoperated animal. Indeed certain segments of a patterned response may be eliminated by injury to the neopallium without abolishing other elements in the pattern or seriously reducing its biological effectiveness (e.g., maternal behavior in the female rat (7)).

No investigator has reported intensive, quantitative tests of sexual behavior in female rats before and after removal of the cerebral cortex. The experiment which is to be described was designed to reveal the effects of partial and complete decortication upon each of the several discrete reactions that are coordinated in a pattern commonly termed "sexually receptive behavior."

METHODS

In planning the present work it was anticipated that brain injury might in some way effect the functional activity of the pituitary gland. It is well-known that pituitary secretions are responsible for the elaboration of certain hormones by the ovaries; and that under normal conditions ovarian products in turn are essential to the appearance of sexually receptive behavior. To obviate the possibility that cortical lesions might affect mating behavior through interference with the function of the endocrine system, estrus was induced by the administration of the appropriate hormone preparations to ovariectomized females. Earlier studies from our laboratory have shown that under the influence of the hormone treatment used in the present experiment castrated females display sexually receptive behavior which is indistinguishable from that shown by intact estrous females (10).

Twenty virgin female rats raised in segregation were ovariectomized at 3 to 4 months of age. To induce estrus in the spayed animals an intramuscular injection of 500 R.U. of estradiol benzoate was followed after a 48-hour interval by an intramuscular injection of 0.5 mg. of progesterone.[2] Sex tests were conducted 16 to 18 hours after progesterone administration. At least two weeks elapsed between tests, and in this length of time the vaginal smear returned to typical diestrous condition, containing only leukocytes.

Beginning 1 to 3 weeks after castration each female was given 3 preoperative tests in which sexual receptivity was measured quantitatively. A vaginal smear was taken before the test. After the female had been

[1] The experiment herein reported was supported by a grant from the Committee for Research in Problems of Sex, National Research Council.

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[2] Estradiol benzoate (Progynon-B) was supplied by The Schering Corporation, Bloomfield, N. J. Progesterone (Lutocylin) was made available by The Ciba Pharmaceutical Products Co., Inc., Summit, N. J.

allowed a 5-minute period of adaptation to the experimental cage (circular, 30″ in diameter) a sexually vigorous male was introduced. If the original male ejaculated before the end of the test a second male was immediately substituted so that throughout the period of observation the female was continuously subjected to the attentions of an active stimulus male.[3] Male and female remained together in the cage for 5 minutes and records made during this period included the number of times the female was mounted by the male, the number of times the female exhibited lordosis (concave arching of the back facilitating intromission), and the number of hopping responses and ear-vibration responses executed by the female. These 3 reactions: hopping, ear-wiggling, and responding to the male's mounting with the assumption of lordosis constitute, by definition, sexual receptivity in our female rats. Except in very rare instances this behavior can be elicited only when the female is in vaginal estrus, and its manifestation may be regarded as a concomitant of the late follicular or early luteal phase of the ovulatory cycle.

In addition to noting receptive reactions the experimenter recorded observations of the character and amount of resistance which the female exhibited. With the exception of purely passive failure to show lordosis, the only form of resistance consisted of kicking backward with the hind feet when the male attempted to mount.

After the third preoperative mating test the females were subjected to unilateral hemidecortication. Cortical tissue was removed by suction while the animal was under deep surgical anaesthesia.

When the animals had approached or exceeded preoperative weight and appeared to be in good health a second series of 3 sex tests was conducted employing the same techniques used in the preoperative series. At the conclusion of these tests 9 females were subjected to a second operation in which an attempt was made to destroy all of the remaining cortex. Following recovery these animals were observed in 3 additional tests.[4]

At the conclusion of the experiment operated brains were sectioned at 50 micra, stained with thionin, and reconstructed by the method of Lashley (17).

[3] Vasectomized males were employed to avoid impregnation of experimental females. Since it was necessary to elicit copulatory attempts from these males even when they were offered nonreceptive females, all males were occasionally injected with testosterone propionate in order to maintain their sexual excitability at a high level. The hormone preparation employed was Oreton, supplied by The Schering Corporation, Bloomfield, N. J.

[4] In some instances females suffering very large bilateral cortical lesions did not completely regain preoperative weight. Such cases are noted in the presentation of experimental results.

RESULTS

Brain Lesions

Reconstructions of all cortical lesions inflicted in this study are shown in figures I and II. In the first operation the entire neocortex was removed from one hemisphere in the case of 14 females. The fifteenth animal was deprived of 47 per cent of the cortex unilaterally; and the remaining 5 cases sustained unilateral lesions ranging from 29 to 39 per cent of the entire neopallium. Incidental invasion of noncortical structures is described below in connection with other results. Although there was some variation in the extent and locus of the cortical injury there was no relation between these factors and postoperative changes in behavior. Accordingly in the following presentation of results all operated animals have been treated as a homogeneous group.

Effects of Unilateral Cortical Lesions upon Feminine Mating Reactions

Effects upon the lordosis response. In this report the readiness with which a female displayed lordosis is expressed in terms of the number of lordosis responses divided by the number of times the female was mounted. The figure resulting from this procedure is multiplied by 100 and is called the *Copulatory Quotient*, abbreviated to *CQ*. Thus, $\frac{\text{total lordoses}}{\text{total mounts}} \times 100 = CQ$. The *CQ* may range from 0 to above 100. Some receptive females show lordosis every time they are mounted, and in addition they may exhibit this reaction in response to other types of physical contact with the male (such as that resulting from the male's exploration of the vaginal region).

Results summarized in Table 1 indicate the effects of removal of 27 to 50 per cent of the neopallium upon the *CQ* of each of 20 females. Many animals showed some test-to-test variability both before and after operation. Furthermore, if the average *CQ* for each rat in 3 preoperative tests is compared with the average for the same animal in the 3 postoperative tests, some changes are evident. However, such variation occurred in different directions for different individuals, with the result that after partial decortication 9 females exhibited increase in the *CQ*, 9 evidenced a decrease in this measure, and in 2 cases there was

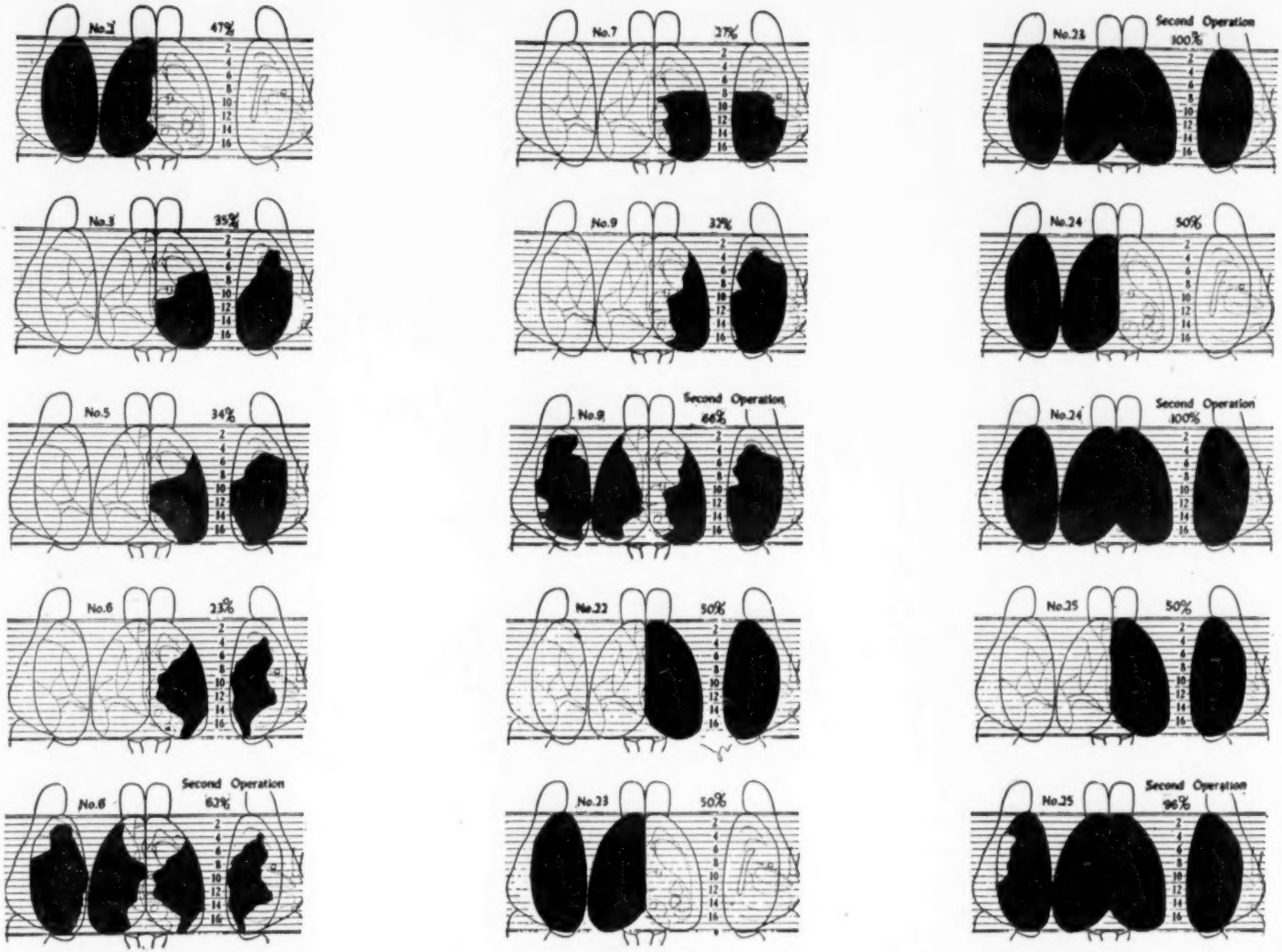
No.2 47%
No.7 37%
No.23 Second Operation 100%
No.3 35%
No.9 32%
No.24 50%
No.5 34%
No.8 Second Operation 66%
No.24 Second Operation 100%
No.6 23%
No.22 50%
No.25 50%
No.8 Second Operation 62%
No.23 50%
No.25 Second Operation 96%
No.28 50%
No.37 50%

FIG. I

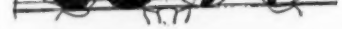

FIG. I

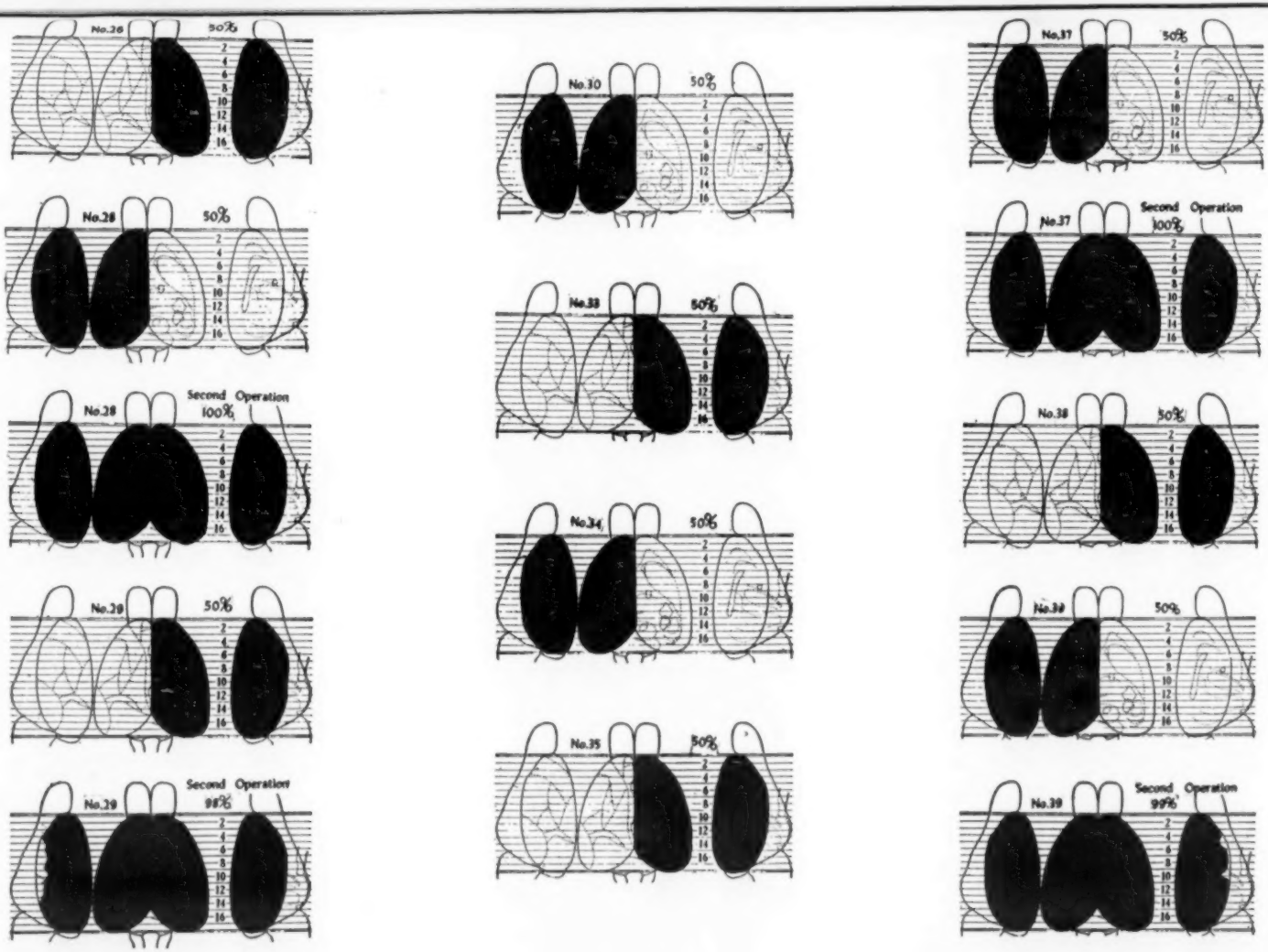

FIG. II

FIGURES I and II. These diagrams represent dorsal and lateral views of the surface of the rat brain. The cortical lesion is shown in black. The number of the experimental animal appears at the left of each diagram and at the right is shown the percentage of neocortex removed.

no change. Values shown in Table 1 reveal that before brain operation the average *CQ* for 20 females was 82; while after operation the group average was 84. The average range for the group (highest *CQ* to lowest *CQ*) did not change significantly after operation.

It is to be noted that although 14 animals suffered loss of an entire hemisphere, while 6 cases sustained smaller lesions, there is no indication of any relation between lesion magnitude and postoperative changes in the *CQ*.

TABLE 1

Effects of unilateral cortical lesions upon the estrous female rat's tendency to show lordosis

Rat	Per cent of neocortex removed	Average *CQ* for 3 tests		Highest *CQ* in any test		Lowest *CQ* in any test	
		Normal	Operated	Normal	Operated	Normal	Operated
2	47	84	79	125	100	40	56
3	35	67	48	100	100	33	0
5	34	58	97	73	100	43	90
6	39	100	97	100	100	100	92
7	27	105	56	111	80	100	14
9	32	88	93	114	100	62	80
22	50	95	87	100	100	86	92
23	50	82	75	100	100	70	37
24	50	100	100	100	100	100	100
25	50	41	48	86	64	0	37
26	50	84	100	100	100	54	100
28	50	100	100	100	100	100	100
29	50	79	63	100	94	54	6
30	50	71	91	100	100	39	84
33	50	76	82	100	95	61	65
34	50	53	98	100	100	10	94
35	50	94	78	100	96	83	46
37	50	83	81	100	89	67	68
38	50	90	102	100	112	70	95
39	50	90	100	100	100	80	100
Mean	46	82	84	100	96	63	68

These data suggest that partial or complete unilateral hemidecortication has no consistent, predictable effect upon the tendency of the female rat in estrous to display lordosis when mounted by the male.

Effects upon the ear-wiggle response. Ear wiggling was shown by each of the 20 females before operation and by 17 cases after partial decortication. This behavior occurred in 72 per cent of the total tests before operation, and was observed in 74 per cent of the postoperative tests for the 17 cases in which the response survived. However, before operation 233 ear-wiggle reactions were shown by 20 rats; and after operation the reaction was displayed 415 times by17 individuals. Seventeen females executed an average of 5.2 ear-wiggles per test before operation, and 8.0 ear-wiggles per test after operation.

Table 2 presents pre- and postoperative records of the ear-wiggle response for all females. Following brain operation the average number of ear-

TABLE 2

Effects of unilateral cortical lesions upon the ear-wiggle response in estrous female rats

Rat	Average number of ear-wiggles per positive test*		Highest number of ear-wiggles in any test		Lowest number of ear-wiggles in any test	
	Normal	Operated	Normal	Operated	Normal	Operated
2	2.0	0	2	0	0	0
3	1.0	8.0	1	9	0	0
5	5.5	7.3	8	8	3	6
6	5.0	5.0	7	7	0	0
7	3.0	2.0	4	6	2	0
9	2.5	10.0	4	13	1	7
22	7.3	5.0	17	5	1	0
23	5.0	1.0	5	1	0	0
24	10.1	3.7	14	8	4	1
25	2.0	0	2	0	0	0
26	2.5	11.5	4	4	0	0
28	12.7	17.0	18	21	8	12
29	4.5	8.0	7	8	0	0
30	4.0	3.7	4	5	0	3
33	4.7	19.7	7	22	1	18
34	3.5	16.7	6	22	0	10
35	5.0	0	6	0	3	0
37	5.7	18.0	10	22	0	13
38	6.0	19.0	12	28	1	11
39	3.3	1.0	5	1	2	0
Mean	4.8	7.8	7.1	9.5	1.3	4.0

* Including only those tests in which the response occurred at least once.

wiggles per positive test increased in 10 animals, decreased in 9, and was unchanged in 1. However, the 10 females whose scores increased showed an average postoperative gain of 8.7 responses per test; while the 9 rats with lowered scores after operation decreased by an average of only 2.8 ear-wiggles per positive test.

The effects of partial decortication thus appear to have been two-fold. The ear-wiggle response was eliminated in 3 females. The 17 cases in which

it survived brain injury displayed the reaction in the same proportion of their tests before and after operation; but during those postoperative tests in which ear-wiggling did occur its average frequency for the group was noticeably increased.

Effects upon the hopping response. Each of the 20 females showed hopping behavior in at least 1 of 3 preoperative tests. This response survived brain operation in 19 animals. A total of 271 hops occurred in 46 preoperative tests; and 464 hops were recorded in 48 postoperative tests. The 19 females which reacted both before and after operation hopped an average of 5.3 times per test preoperatively, and 8.3 times per postoperative test.

Scoring each animal on the basis of average number of hops per positive test before and after cortical injury reveals that 13 cases showed an increase in this behavior, while 7 females exhibited a decrease. As in the case of the ear-wiggle response, the increases in the hopping reaction were of greater magnitude than were the decreases. Thirteen rats exhibited an average postoperative increase of 6.8 hops per test; and the scores of 7 cases decreased by an average of 3.5 hops per test.

Data presented in Table 3 indicate the direction and magnitude of changes in the behavior of individual animals.

Unilateral cortical invasion is thus seen to have eliminated hopping behavior in one individual, decreased its frequency in 6 others, and increased its frequency in the remaining 13 animals.

Effects upon the back-kicking response. Females may resist the male's attempts to explore the vaginal region or to mount by kicking backward with the hind feet. This behavior is shown occasionally by many of the estrous females from our colony. During positive tests the female may back-kick at one moment and permit the male to copulate immediately thereafter.

Before partial decortication each of 20 rats in this experiment showed the back-kicking reaction at least once. After operation the response was exhibited by 16 cases. Those females that back-kicked both before and after operation showed such behavior in 86 per cent of the preoperative and 64 per cent of the postoperative tests. The 16 cases in which the response occurred after operation exhibited an average of 3.7 back-kicks per positive test preoperatively, and 2.5 back-kicks per positive test postoperatively.

There are thus 3 points in evidence to indicate that partial decortication tends to reduce back-kicking. This behavior was eliminated in 4 of the 20 cases after the operation. For the 16 rats in which the response survived, the proportion of tests in which such behavior occurred was reduced after brain injury. During those postoperative tests in which back-kicking appeared the reaction was executed less frequently than preoperatively.

TABLE 3

Effects of unilateral cortical lesions upon the hopping response in estrous female rats

Rat	Average number of hops per positive test*		Highest number of hops in any test		Lowest number of hops in any test	
	Normal	Operated	Normal	Operated	Normal	Operated
2	2.0	4.0	2	8	0	1
3	2.5	1.5	3	2	2	0
5	3.0	6.3	5	10	1	3
6	4.0	2.7	6	1	2	5
7	3.7	3.0	4	3	3	0
9	2.5	3.3	3	4	2	3
22	14.0	5.5	29	10	2	0
23	8.0	4.7	15	7	0	2
24	10.7	6.7	15	11	3	3
25	4.0	3.0	9	3	0	0
26	4.7	17.0	7	4	1	0
28	11.7	18.7	21	23	6	15
29	5.0	3.0	5	3	0	0
30	6.0	6.7	6	5	0	3
33	4.0	14.3	8	20	1	11
34	4.0	22.3	7	36	0	9
35	6.7	0	13	0	3	0
37	1.0	2.0	1	2	0	0
38	4.0	20.7	6	28	1	8
39	6.0	18.3	11	1	2	0
Mean	5.1	8.3	8.8	9.0	1.4	3.1

* Including only those tests in which the response occurred at least once.

Effects of Complete Decortication upon Feminine Mating Reactions

Bilateral cortical lesions were inflicted in the case of 9 females. Seven of these animals were deprived of 97 to 100 per cent of the neopallium. In considering the effects of bilateral injury we have included only those data gathered from observations of these females. They will be referred to as "complete decorticates" although, as can be seen from reconstructions presented in Figures I and II small neocortical remnants remained in 3 cases.

Effects upon the lordosis response. Table 4 re-

veals some of the effects of partial and of complete decortication upon the estrous female's tendency to exhibit lordosis. The average *CQ* (Copulatory Quotient) for the group of 7 females was remarkably constant throughout the experiment, varying less than 1 point after each operation.

The rank-order of the 7 individuals was likewise relatively unaffected by cortical loss. Female 25 ranked seventh in the preoperative tests (lowest average *CQ*). After removal of the neocortex from one hemisphere No. 25 still ranked seventh; and complete decortication did not alter her rank. Animal 29 ranked sixth as a normal, and retained this rank after each operation. Number 23 ranked fifth, and 37 fourth throughout all 3 test series.

TABLE 4

Effects of hemi- and complete decortication upon the estrous female rat's tendency to show lordosis

Rat	Average *CQ* in 3 tests as:			Range of *CQ* in 3 tests as:		
	Normal	Hemidecorticate	Decorticate	Normal	Hemidecorticate	Decorticate
28	100	100	117	100–100	100–100	100–150
24	100	100	89	100–100	100–100	53–113
39	90	100	103	80–100	100–100	100–108
37	83	81	85	67–100	68– 89	75–100
23	82	75	75	70–100	37–100	38–100
29	79	63	55	54–100	6– 94	31–100
25	41	48	48	0– 86	37– 64	0– 83
Mean	82.1	82.4	81.7	67– 98	64– 93	57–108
				D = 31	D = 29	D = 51

The remaining 3 animals maintained approximately the same rank orders after each operation. Comparing preoperative *CQ* with *CQ* after total decortication we find the rank-order coefficient of correlation to be +.94.

Group means presented in Table 4 indicate that complete decortication had little effect upon the lordosis response as measured by the average *CQ*; but close inspection of daily test results reveals that in several animals loss of the neopallium was followed by definite peculiarities in the female's tendency to exhibit lordosis. These postoperative changes are difficult to describe quantitatively but seem to have sufficient importance to be reported in qualitative terms.

Rat No. 23 did not exhibit an increase in *CQ* after decortication. However, as a complete decorticate this animal showed lordosis when a pipette was inserted in the vagina as the vaginal smear was being taken. Although she was smeared before all pre- and postoperative tests, female No. 23 never responded to the pipette in this fashion before complete decortication.

In all tests as a normal and as a hemidecorticate rat No. 24 showed a *CQ* of 100. After complete decortication her *CQ* varied from 53 to 113. In one test this female exhibited lordosis when the male nosed at her vaginal region without mounting. At the time of another test female No. 24 displayed lordosis when the pipette was introduced into the vagina to secure the vaginal smear; but immediately thereafter when placed with a male she exhibited a low *CQ* of 53. In this particular test rat No. 24 was very slow to show lordosis and kept moving about the cage, carrying the male upon her back when he mounted. When at length the male did succeed in copulating, the female held the lordosis position for many seconds after the male had dismounted. Before complete decortication rat No. 24 never showed lordosis when the smear was taken, never failed to give lordosis when mounted by the male, and never maintained lordosis after the male had dismounted.

After complete decortication female No. 28 exhibited lordosis when the male's paws touched her back,—a reaction which had not occurred in previous tests. In addition this animal stiffened into the lordosis position when picked up in the experimenter's hand. If she was placed gently upon the table the female remained in the lordosis pose for several seconds after the hand was withdrawn. When the male dismounted after copulation female No. 28 held lordosis for several seconds. In one test lordosis was maintained without interruption while the male copulated 4 times. None of the reactions described above were shown by this individual prior to removal of the neocortex.

Female No. 29 showed a reduction in the *CQ* following complete decortication. However, as a complete decorticate this animal exhibited lordosis when the pipette was inserted in the vagina and, upon occasion, when the male investigated without mounting.

As complete decorticates female No. 37 displayed lordosis when the male explored; and rat No. 39 responded to the insertion of the pipette with the assumption of lordosis.

The protocol excerpts cited above suggest that in some postoperative tests 6 of the 7 decorticated

females gave evidence of increase in the readiness to display lordosis.[5] Four animals showed lordosis when the pipette was inserted in the vagina. Four exhibited this response when the male explored without mounting. One rat stiffened into lordosis in the experimenter's hand. Such changes in behavior might reasonably be expected to result in an increase in the *CQ*, but mean values presented in Table 4 indicate that no such increase occurred. Some insight into the reasons for this apparent contradiction may be derived from a comparison of the average range of *CQ* scores before and after decortication.

Table 4 includes the lowest and highest *CQ* recorded for each female in 3 tests before and 3 tests after operation. Preoperatively the average of the lowest *CQs* for the group was 67; while the mean of the highest *CQs* was 98. The difference between these two values, that is the *average range*, was thus 31 points. Hemidecortication had no pronounced effect upon this measure. However, after complete decortication the average of the lowest *CQs* was 57 (10 points below preoperative levels); and the average of the highest *CQs* was 108 (10 points above preoperative levels). The average range after complete decortication was therefore 51 points,—20 points greater than the preoperative average range.

Loss of the cerebral cortex is thus seen to have increased the variability of the female's tendency to show lordosis. Although in one test after operation a female might exhibit a *CQ* higher than any shown preoperatively, the same animal in a second postoperative test was not unlikely to display a lower *CQ* than had been recorded for her before operation. This lack of consistency extended to behavior displayed at different times in the same test. For example, female No. 24 exhibited lordosis when a pipette was inserted in the vagina. Placed with a male immediately afterward she was mounted and palpated 17 times, but lordosis occurred only 8 times (*CQ* = 53).

Effects upon general activity. The effects of decortication upon general activity will be considered at this point because postoperative changes in activity frequently exerted a marked effect upon the *CQ*. Several experimenters have described increases in "spontaneous" activity in the rat following injury to various portions of the cerebrum (9, 16, 18).

Four of the 7 decorticated females whose sexual behavior is described here exhibited pronounced increases in activity in postoperative tests. This hyperactivity took the form of running rapidly around and around the perimeter of the circular testing cage. Often a decorticate female made as many as 25 complete circuits of the cage without stopping (approximately 65 yards). After complete decortication this behavior was exhibited by females No. 23, 25 and 37 in all 3 tests, and by No. 39 in 2 of the 3 tests.

Normal female rats in estrous are usually quite active, frequently hopping away at the male's approach. The male appears to be stimulated by this purely temporary retreat, and follows the female closely. After a few hops the normal, estrous female stands still, allows the pursuing male to mount and responds with the assumption of lordosis. The decorticated females showed no such cooperative behavior. As hyperactive females displayed the continuous running the males usually pursued vigorously, and frequently clasped the female momentarily. Under such conditions the hyperactive rats showed no response to the male's clasp, but persisted in their circumlocutions of the cage, often dragging the clasping male for some distance before he was shaken loose. Some males became quite adept at maintaining the clasp and at the same time keeping up with the female by prodigous hops of the hind legs. Even this exhausting persistence failed to elicit lordosis on the part of the female.

The impression gained from repeated observations of this behavior was one of a new and impelling drive superimposed over an original one. The tendency to show lordosis did not seem to have been eliminated nor even necessarily weakened; but appeared to be temporarily, completely overridden by the extremely powerful drive toward hyperactivity. In the course of a single test highly receptive behavior often alternated with periods of continuous running during which the lordosis response was totally suppressed. For example, one female (No. 37) stood stationary in the cage and showed lordosis to every mount while the male copulated 10 times. After the tenth copulation the female suddenly began circling the cage and continued to do so without interruption for the remainder of the observation period. While she was running the male attempted to mount several

[5] It is of interest to note that the only animal which failed to show any increase in the tendency to exhibit lordosis was female No. 25 who displayed the lowest *CQ* of the group in all pre- and postoperative tests.

times and was unable to induce the female to halt or even to depart from her stereotyped path around the circumference of the cage.

Both phases of this female's behavior represent marked deviations from the normal pattern. Intact females, no matter how receptive, never remain in the same spot permitting repeated copulations. Almost invariably after a completed copulation the female moves away. The male then pursues and another copulation ensues. On the other hand, the intact estrous rat does not run around the cage continually, paying no attention to the male's attempts to mount. If a normal female is nonreceptive she may run away from the male, but his mating attempts are actively resisted by back-kicking, rolling over on the back, or even by assuming the offensive and launching a vigorous attack. Furthermore the unoperated, nonreceptive female runs away only when the male approaches, while the decorticates reported herein persisted in their running regardless of the male's behavior.

The hyperactivity shown by 4 decorticate females tended to reduce their *CQ* scores because they failed to exhibit lordosis when mounted during periods of heightened activity. This reduction in the *CQ* was however counterbalanced by the increased ease with which lordosis could be elicited when the females were inactive. The net result was therefore an increased variability of the measure in question.

Extreme inactivity was observed to alternate with hyperactivity in the case of female No. 37 described above. Another animal (No. 28) was completely inactive at all times. In every test after decortication this female's only movement about the cage occurred when she was shoved forward by the force of the male's copulatory thrusts.

Effects upon the ear-wiggle response. In Table 5 are presented data indicating the effect of complete decortication upon the estrous female's tendency to display the ear-wiggle response. This reaction was exhibited by all females before and after removal of the cerebral cortex. Ear-wiggling appeared in 71 per cent of the tests before operation, and in 95 per cent of those given after decortication. During those tests in which the response occurred it appeared an average of 6.6 times per test before, and 11.2 times after operation. These scores suggest that the ear-wiggle reaction was evoked more easily in decorticated than in intact females.

Additional evidence of the increased ease with which this item of estrous behavior was elicited after removal of the neocortex is found in the daily records of 2 females. Rat No. 28 showed ear-wiggling postoperatively when picked up by the experimenter. Female No. 29 exhibited this response after operation when a pipette was inserted in the vagina to collect the smear. Before complete decortication neither female showed ear-wiggling save when with the male.

Although females tended to display the ear-wiggle more readily after removal of the cerebral cortex this item of estrous behavior lacked, in some decorticates, normal integration with the other behavioral elements which make up the mating pattern of the unoperated female. Normal, receptive females in our colony display ear-wiggling in close conjunction with the hopping response,—usually showing the ear vibration immediately after a series of several hops. Frequently the female hops, poses and ear-wiggles, and, as the male mounts, the ear movement is continued during the actual copulation. Appearance of the ear-wiggle is an almost infallible sign of high sexual receptivity.[6] Following decortication some females often exhibited the ear-wiggle response at times when other aspects of the receptive pattern were lacking.

In several instances rat No. 25 was mounted by the male, failed to display lordosis, and then executed the ear-wiggle when the male dismounted. This same animal displayed repeated periods of hyperactivity during which the male pursued her around the periphery of the cage. As she continued to run the female ear-wiggled almost continuously. Female No. 29 showed a marked postoperative increase in ear-wiggling (Table 5), but always exhibited this response immediately after the male dismounted rather than before and during the mount as is the case with the normal female. Rat No. 39 displayed no postoperative changes in the ear-wiggle response during tests with the male; but following decortication this rat showed ear-wiggling when a pipette was inserted in the vagina.

These data suggest that the actual frequency of ear-wiggling rose postoperatively but that the concatenation of this response with other elements in the copulatory pattern was in some instances

[6] Although this relationship is very close in animals of our stock it is apparently less so among female rats from some other colonies (1).

disrupted. This indication is strengthened by the fact that whereas in normal females there is a close relationship between ear-wiggling scores and willingness to show lordosis, the degree of this relationship is considerably reduced by decortication. Comparison of the rank order of the 7 females rated as to *CQ* and average number of ear-wiggles per positive test reveals a rank order correlation of +.79 between these two variables before operation, and a coefficient of +.41 after removal of the cerebral cortex.

Effects upon the hopping response. Removal of the neocortex eliminated hopping in 2 of the 7 females. As shown by the group averages presented in Table 5, the remaining 5 animals tended to exhibit this response in a higher proportion of tests after operation, and to hop somewhat more frequently in positive tests following decortication. However, in 3 cases the average frequency increased and in the remaining 2 it decreased. The average for all 5 females rose only slightly after operation. These data can only be taken to suggest that decortication may totally eliminate hopping or may be followed by moderate increases or decreases in frequency of the response.

Two of the 5 females in which hopping reactions survived loss of the neocortex displayed definite postoperative abnormalities in the execution of the

TABLE 5

Effects of complete decortication upon the estrous female rat's tendency to exhibit ear-wiggling, hopping and back-kicking

Response	Per cent of the group showing the response		Rat	Per cent of tests in which the response appeared		Average frequency of response for tests in which it appeared	
	Normal	Decorticate		3 tests as normal	3 tests as decorticate	3 tests as normal	3 tests as decorticate
Ear-wiggling	100	100	23	33	67	5.0	6.5
			24	100	100	10.3	7.0
			25	33	100	2.0	15.3
			28	100	100	12.7	9.0
			29	67	100	4.5	27.3
			37	67	100	8.5	11.0
			39	100	100	3.3	3.3
	Average			71	95	6.6	11.2
Hopping	100	71	23	67	100	8.0	4.7
			24	100	100	10.7	7.0
			25	67	100	6.0	13.3
			28	100	0	11.7	0
			29	33	100	5.0	6.3
			37	67	0	1.0	0
			39	100	100	6.0	10.0
	Average for cases that showed the response			76	100	6.9	8.3
Back-kicking	100	14	23	67	33	2.5	1.0
			24	67	0	7.5	0
			25	100	0	2.3	0
			28	67	0	3.0	0
			29	100	0	5.3	0
			37	33	0	1.0	0
			39	33	0	4.0	0
	Average for cases that showed the response			67	33	3.6	1.0

response. As described above the normal female in estrous hops away from the male and then halts and permits copulation. Hopping thus appears as a prelude to coition and in all probability serves as one source of precopulatory stimulation contributing to the male's state of sexual excitement. Two decorticate females tended to display hopping at what might be termed "inappropriate" times; and in their behavior this reaction was not normally integrated with the other elements in the mating pattern. Scores presented in Table 5 show that after decortication rat No. 25 hopped more than twice as frequently as she had before operation. However in postoperative tests this female rarely executed the hopping response until immediately after the male had dismounted. Many copulations were followed by hopping on the part of the female but only infrequently did the behavior precede the male's mount as it commonly does in the case of the intact female. In one test this decorticate rat was mounted by the male 3 times and failed to show lordosis in each instance; but after every unsuccessful copulatory attempt the female hopped as soon as the male released her.

Female No. 29 exhibited postoperative hopping behavior closely comparable to that reported for the animal described above. After decortication No. 29 showed an increase in the frequency of the hopping reaction (Table 5). However, the vast majority of her hopping responses occurred immediately after the male had dismounted.

Continued observation of both of these decorticate females indicated that the frequency of "precopulatory" hopping was markedly decreased, and that the appearance of this reaction usually depended upon strong and direct stimulation which occurred when they were clasped and palpated by the male.

Effects upon the back-kicking response. Values shown in Table 5 reveal that removal of the cerebral cortex had a pronounced tendency to abolish back-kicking. Although this response was exhibited by each of the 7 females prior to operation it was shown by only one animal after decortication, and in that case occurred a single time in but one test. Six of 7 decorticates thus showed no active resistance to the male's sexual advances.

The scores of the seventh animal, female No. 23, reveal a marked postoperative decrease in the frequency of back-kicking. In this rat decortication was followed by the appearance of a peculiar type of aggressive behavior. As soon as the male was placed in the testing cage the female customarily approached and attempted to bite him. Severe wounds were often inflicted. These attacks were entirely unprovoked and apparently had no relationship to the male's copulatory behavior nor to the female's receptive responses. The female did not attack the male when he was attempting to mate nor immediately after a completed copulation. To all intents and purposes the female's aggression was entirely dissociated from her sexual behavior and the attacks had no apparent effect upon her copulatory scores.

In Table 6 we have summarized the qualitative descriptions of deviations from the normal, sexually receptive pattern which appeared in the behavior of the decorticate females.

Some evidence was obtained indicating that decorticated females were less capable of stimulating the sexual advances of the male than were normal females. Males were placed in the cage with a decorticate female and an intact female, both fully in estrous and completely receptive. Under these conditions males showed a marked tendency to discriminate against the brain-operated female and to mate almost exclusively with the intact animal. These incidental observations were not made under controlled conditions and therefore deserve only the briefest mention.

Effects of Cortical Injury upon Body Weight

First operation. In Table 7 are presented data showing the effects of unilateral brain injury upon the body weight of 14 of the 20 females whose behavior has been reported above. Weight records of the remaining 6 cases are not available but there is no reason to assume that they would have differed significantly from those presented here. It will be noted that by the time the first postoperative test was administered 11 of the 14 individuals exceeded their preoperative weight. Three animals still weighed less than they had at the time of operation. The weight of unoperated animals frequently varies as much as 10 per cent and it is therefore safe to assume that when postoperative testing was initiated all 20 animals were in good health insofar as body weight reflects this condition. Between the first and last postoperative test 8 animals increased in weight, 5 decreased, and one showed no change. All of the weight losses were small. The average weight for the group increased after operation and increased again during the testing series. These data seem

to indicate that the animals described were in good health following recovery after the first brain operation. Inspection of test results fails to show any difference between the behavioral performance of those animals which lost weight as compared with those which gained.

means in Table 8 indicates that at the time of the second brain operation the average weight was slightly above that recorded prior to the first operation. Following the second operation the average weight decreased somewhat, and at the beginning of the second period of postoperative tests it was

TABLE 6

Abnormalities appearing in the execution of separate elements in the mating behavior of the estrous female rat, or in the integration of these elements into a functional pattern, following removal of the neocortex

Rat	Lordosis response	General activity	Ear-wiggle response	Hopping response
23	Gave lordosis in response to pipette. When male mounted female rolled over and stiffened into lordosis while lying on her side.	Circled cage rapidly in all tests, male following. In one test made 25 circuits without stopping.	No apparent abnormalities.	No apparent abnormalities.
24	Gave lordosis in response to pipette. Held lordosis for several seconds after male dismounted.	Ran about cage dragging male on her back.	No apparent abnormalities.	No apparent abnormalities.
25	(See notes on activity.)	Often failed to stand still when mounted by male. Circled cage repeatedly with male following. 9 circuits without stopping. Repeated 4 times in one test.	Ear-wiggled continuously while circling cage during hyperactive stage. Ear-wiggled immediately *after* male dismounted, even though female may not have shown lordosis.	Hopped immediately *after* male dismounted, even though female may have shown no lordosis.
28	Assumed lordosis in experimenter's hand when picked up and held it when put down. Lordosis whenever male mounted or put paws on her back. Held lordosis for long periods after male dismounted. Often permitted 3 or 4 copulations without relaxing from lordosis assumed upon the first mount.	Remained in spot where she was placed by experimenter. Only movement about cage occurred when female was shoved by male. Frequently received 6 to 10 copulations without moving a step.	Ear-wiggled when picked up by the experimenter.	No apparent abnormalities.
29	Gave lordosis in response to pipette. Showed lordosis when male investigated without mounting.	No apparent abnormalities.	Ear-wiggled *after* male dismounted. This occurred 27 times in one test.	Hopped *after* male dismounted.
37	Gave lordosis when male investigated without mounting.	In one test stood motionless for 10 copulations, then circled cage repeatedly. In all tests circled cage many times without stopping.	No apparent abnormalities.	No apparent abnormalities.
39	Gave lordosis in response to the pipette.	Circled cage repeatedly at a rapid run in 2 tests.	Ear-wiggled in response to the pipette.	No apparent abnormalities.

Second operation. Records of the body weights of 7 of the 9 animals sustaining extensive bilateral brain injury are summarized in Table 8. The weight records of the remaining 2 cases are not available, but there is no reason to assume that they would have differed significantly from those of the other animals. Inspection of the group

still below preoperative levels. During the course of the tests following the second operation the average body weight decreased slightly. At the time of the beginning of the postoperative testing schedule 5 animals were below and 2 were above the weight recorded at the time of the second operation. In 2 individuals the loss exceeded the

limits of normal variation, being greater than 10 per cent of the body weight (Nos. 23 and 37). In the remaining 3 cases the loss was less marked. During the course of the postoperative tests 3 females increased, 3 decreased in weight and one did not change. Only one of these changes exceeded 10 per cent of the total body weight (No. 23). A

TABLE 7

Effects of unilateral cortical injury upon body weight

Rat	Weight before operation	Weight at first postoperative test	Weight at last postoperative test
22	249	232	228
23	234	254	262
24	233	239	250
25	257	258	271
26	246	259	249
28	210	212	219
29	340	306	345
30	255	246	255
33	195	256	239
34	225	240	242
35	235	273	269
37	245	255	249
38	210	249	252
39	260	261	261
Mean	242	253	256

TABLE 8

Effects of bilateral cortical injury upon body weight

Rat	Weight before first operation	Weight before second operation	Weight at start of tests after second operation	Weight at end of tests after second operation
23	234	255	216	193
24	233	245	250	238
25	257	260	257	258
28	210	215	221	216
29	340	330	310	315
37	245	255	224	224
39	260	253	248	261
Mean	254	259	246	243

careful inspection of test results reveals that the mating behavior of females which were below preoperative weight was closely comparable to that of those animals which regained their original weights.

However, the data at hand do suggest a possible reason for weight loss in the 2 cases where it was greatest. Females No. 23 and 37 showed the most marked loss in weight following the second operation; and neither of these animals gained weight in the course of the testing series. Both individuals were noticeably hyperactive during postoperative tests. It seems likely that the frequent bursts of constant activity occurring during the periods of observation were symptomatic of a general level of increased activity which persisted while the animals were in their living cages. It is quite possible that this hyperactivity was responsible for the failure of these animals to regain weight lost immediately after operation.[7]

Effects of Incidental Invasion of Noncortical Structures

First operation. It will be recalled that the first operation inflicted upon each female was unilateral, being restricted to either the right or left cerebral hemisphere. In 18 of the 20 operated cases the fibers of the corpus callosum directly underlying the cortical lesion were destroyed. In the remaining 2 females only medial remnants of the corpus callosum were left intact. There is no reason to assume that removal of those parts of the corpus callosum which are subadjacent to destroyed cortical areas should exert any effect beyond that produced by the cortical damage alone.

The hippocampus of one hemisphere was completely destroyed in 7 cases. In 6 rats only the dorsal or the lateral portions of the hippocampus were removed, and in the remaining 5 females the hippocampus was uninjured. Comparison of the behavioral records of 7 individuals lacking the hippocampus and 5 individuals with this structure intact indicates that hippocampal injury under these conditions has no detrimental effect upon feminine mating responses. There is on the contrary some suggestion that unilateral destruction of the hippocampus combined with neocortical injury may be followed by greater increase in the frequency of certain estrous reactions than brain loss which is confined to the neopallium. This effect however is merely suggested by the few data available.

The corpus striatum was unilaterally invaded in all operations. In 5 rats the striatal lesion was slight and was restricted to the lateral or dorsal

[7] Several earlier studies have shown that certain types of cortical injury may result in marked increase in general activity coupled with a rise in the amount of food ingested daily, and at the same time with a definite loss in body weight (9, 14, 15).

portions of the head of the caudate nucleus of one hemisphere. Twelve females sustained injury involving more than half of one corpus striatum. In the majority of these cases the loss was confined to the caudate. Comparing the test scores of females with minor striatal injury to those with more extensive invasion of this structure reveals that major unilateral lesions do not have a depressing effect upon the reactions considered. On the contrary animals suffering major invasions of the caudate tended to show greater postoperative increases in the frequency of ear-wiggling and hopping than did those cases suffering slight injury to the basal ganglia. Here again as in the case of the hippocampus the small group differences cannot be regarded as reliable. Increases in the frequency of estrous reactions were not the invariable sequelae to extensive striatal damage. Some individuals suffering the greatest injury to the basal ganglia failed to show postoperative increase in any of the measures employed, whereas others with very slight caudate injury exhibited marked increases.

In 18 of the 20 operated females the thalamus was intact. One rat suffered moderate invasion of the medial geniculate nucleus and the final case sustained a lesion involving nearly all of the dorsal thalamus and epithalamus anterior to the posterior commissure. The postoperative behavior of the 2 females with thalamic injury did not differ in any way from that of those individuals in which the thalamus was spared.

Second operation. Nine rats were subjected to a second operation in which part or all of the remaining neocortex was removed. The total lesion after the second operation ranged from 62 to 100 per cent of the neopallium.

The corpus callosum was completely destroyed in all of these animals.

The hippocampus of both hemispheres was intact in 4 individuals. This structure was intact on one hemisphere and partially or completely destroyed on the opposite hemisphere in 2 cases. It was completely destroyed bilaterally in 3 cases. Careful inspection of test results fail to show any differences between the postoperative behavior of females in these 3 groups. The data point strongly to the conclusion that hippocampal injury combined with removal of the overlying neopallium has no effect beyond that produced by cortical injury alone.

The 9 bilaterally operated females included 3 cases in which invasion of the corpus striatum was confined to minor injury of the lateral aspects of the caudate. In 2 rats striatal invasion was slight on one hemisphere and much more extensive on the opposite hemisphere. The remaining 4 cases suffered loss of 25 to 50 per cent of the striatum on both hemispheres. The postoperative behavior of females with extensive bilateral striatal injury differed in no observable manner from that of other individuals suffering very slight invasion of this subcortical region. There is no suggestion in our findings that injury to the basal ganglia and the cortex has any effect in addition to that to be expected from purely cortical removal.

The thalamus was not invaded in 6 of the 7 bilaterally operated females. In the seventh case the medial geniculate nucleus sustained lateral injury which was apparently without effect upon postoperative behavior. In most cases the pyriform cortex was intact. Six animals suffered varying amounts of destruction of this region, but in no case did such invasion produce any detectable change in behavior.

DISCUSSION

Results of the present investigation are in agreement with the findings of earlier workers in showing that neocortical tissue is not essential to mating behavior in the female rat in estrous. The normal estrous pattern includes 3 discrete responses, namely lordosis, ear-wiggling and hopping. The frequency with which these acts occur does not tend to be reduced by injury to the cortex. In fact in some animals there is a distinct postoperative increase in response frequency. Sexually receptive behavior in the form of back-kicking to prevent the male's attempts to mount is greatly reduced or eliminated following decortication.

The survival of the female rat's mating behavior despite removal of the cerebral cortex stands in marked contrast to the complete loss of copulatory reactions which follow decortication in the male of this species. Male rats from our colony do not mate, and show little or no interest in the receptive female following destruction of the neopallium (8). In the male this type of brain injury always results in marked reduction in the capacity for sexual arousal. This clear cut sexual difference in the importance of the cortex to the occurrence of mating behavior is of definite theoretical interest.

The evidence presented in the present report should not be taken to indicate that the neocortex

does not participate in the mediation of the normal female's copulatory behavior. Although the separate receptive reactions survive extensive cortical destruction, the integration of these items of behavior into a smooth-flowing pattern of concatenated responses is often partially disrupted after brain operation. In the intact female the cortex is at least partially responsible for the sequential timing of the separate estrus responses. In the absence of the cortex, although none of the discrete reactions are lost, the biological effectiveness of the pattern as a whole is reduced. Poorly timed execution of the disintegrated elements in some cases actually interferes with the male's attempt to achieve intromission, and in other cases appears to reduce the "stimulation value" of the female as a sexual object.

SUMMARY

Methods

Twenty virgin female rats raised in segregation were ovariectomized at 3 to 4 months of age. Estrous was induced in these animals by the injection of estradiol benzoate and progesterone. Each animal was observed in mating tests with a sexually vigorous male during 3 successive periods of induced estrous. Records taken during every test, included the number of times the female was mounted by the male, the number of times the female exhibited lordosis (concave arching of the back facilitating intromission), the number of hopping responses and ear-vibration responses executed by the female, and the number of times the female kicked backward in an attempt to resist the male's sexual mounts.

After the third preoperative mating test part or all of the neocortex was removed from one hemisphere. Following postoperative recovery estrous was induced by hormone administration and a second series of 3 sex tests was administered to each female. At the conclusion of these tests 9 rats were subjected to a second operation in which part or all of the remaining cortex was destroyed. Only the records of 7 females deprived of 97 to 100 per cent of the cortex were subjected to extensive analysis. Following recovery these animals were observed in 3 additional sex tests during induced estrous.

Results

Unilateral removal of 29 to 50 per cent of the neocortex in 20 females. The tendency to exhibit lordosis (as measured by the Copulatory Quotient) showed no consistent change. Ear-wiggling was eliminated in 3 individuals, decreased in 6, increased in 10, and remained the same in one animal. Increases in the frequency of ear-wiggling were of greater magnitude than were decreases. Hopping was eliminated in one female, decreased in 8 cases, and increased in 11. Increases were more extensive than decreases. Back-kicking was eliminated in 4 rats and reduced markedly in the remaining 16 individuals.

Destruction of 97 to 100 per cent of the neocortex in 7 females. Average *CQ* (Copulatory Quotient) scores were relatively unaffected, but the female's tendency to show lordosis became more variable. In the same test a female would display lordosis when the male investigated without mounting; and 2 minutes later the same animal might fail to show lordosis in response to several successive copulatory attempts by the male. Six of the 7 decorticates displayed lordosis in response to stimuli which had not elicited this reaction prior to operation (pipette in the vagina, grasp of experimenter's hand, male's preliminary investigations, etc.). Two females frequently maintained the lordosis position long after the male had dismounted, and one animal often permitted several successive copulations during the same lordosis. Five of 7 rats experienced periods of hyperactivity, repeatedly circling the perimeter of the cage at a fast run. During such periods males were rarely able to force a lordosis. This fact contributed to the increased variability of the *CQ* scores.

Ear-wiggling increased in 4 of the 7 females, decreased in 2 and remained the same in one rat. Increases were of greater magnitude than were decreases, and the average frequency of this response for the group rose from 6.6 per positive test before operation to 11.2 after decortication. Two rats displayed ear-wiggling in response to stimuli which had not elicited the behavior preoperatively (pipette in the vagina, and grasp of the experimenter's hand). In 2 individuals although the ear-wiggle reaction increased in frequency after decortication, it lacked normal integration with remaining elements of the receptive pattern, appearing only after the male dismounted instead of before and during the copulation.

Hopping was eliminated in 2 cases, decreased in 2 and increased in 3. In 2 females postoperative hopping usually occurred immediately following the male's dismount and rarely appeared before the

mount as it does in the pattern of the normal female.

Back-kicking was eliminated in 6 of 7 females and the frequency of its occurrence was markedly reduced in the seventh individual.

Incidental observation suggested that completely receptive decorticate females were sexually less stimulating to the male than were intact females.

Records of changes in the bodily weight of the operated females indicate that after operation the animals were in good health.

Careful study of incidental invasions to noncortical structures appeared to support the conclusion that postoperative changes in behavior were primarily if not exclusively the result of neocortical damage.

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PROCEEDINGS OF THE MEETING ON GASTROINTESTINAL DISORDERS

of

THE AMERICAN SOCIETY FOR RESEARCH IN PSYCHOSOMATIC PROBLEMS

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Chairman, WALTER L. PALMER, M.D.

PHYSIOLOGICAL MECHANISMS INVOLVED IN GASTROINTESTINAL DYSFUNCTION*

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Every reaction of an organism, or of its parts, to a new stimulus is superimposed upon a base line which is already fluctuating and which is a reflection of the organism's response to an ever-changing environment. It is from this basis that all experimentation in physiology must start. If the fluctuations are small in comparison with an artificially induced response, as they are in skeletal muscle, then the relation of the experimental observation to the particular stimulus can be more readily deduced. If, however, as in smooth muscle, the experimentally produced responses are superimposed upon a widely fluctuating base line, interpretation is considerably more difficult, and not always possible. Furthermore the varying physiological state of the tissue at the time of experiment may in itself determine the nature of the response. Thus in the cat, for example, the effect of vagal stimulation on the stomach may be increased peristalsis if the tonus of the organ is low at the time of stimulation, and relaxation if it is initially high. Certainly in the field of the autonomic nervous system the concept of rigid constants and invariable response is an erroneous one which finds no support in physiology.

Both splanchnic and vagal nerves contain motor and inhibitory fibres and the effect of nerve stimulation varies, as we have already seen, according to the physiological state of the organ at the time of experiment. Broadly speaking, however, during sympathetic activity, tonus and peristalsis are reduced and the sphincters closed throughout the entire gut. Digestive juices are generally reduced and mucous secretion abundant. The processes of digestion are thereby inhibited and the emptying time greatly prolonged. Such sympathetic inhibition of gastric and intestinal activity can be brought about reflexly by stimulating many afferent nerves. Two to three days after a severe injury to the head a patient may vomit undigested food partaken just before the accident. Periods of emotional stress may have a similar effect on digestion.

Parasympathetic activity, on the other hand, promotes digestion and aids in the passage of food through the gut. Peristalsis is increased, the sphincters relaxed, and the production of digestive juices, including salivary and pancreatic, is stimulated. The liberation of insulin from the islets of Langerhans is also increased. Wolff and his associates have demonstrated in a patient with a large gastric fistula that hyperaemia of the gastric mucosa accompanied increased motor activity and secretion. The combination of these three, namely hyperaemia, hypermotility and hyperacidity—manifestations of parasympathetic activity—followed intake of food into the mouth, a discussion of appetizing dishes, and periods of emotional stress characterized by suppressed resentment and aggression. The opposite picture, with pallor of the mucosa, decreased gastric motility and diminished secretion, was seen at other times, when the patient was in a psychological state of fear, and the sympathetic system apparently dominant.

In earlier clinical literature there was a tendency to classify patients as *sympathicotonic* or *vagotonic* individuals, according to the particular division of the autonomic nervous system which seemed to

* Abstract of the original paper.

be predominant. The concept, though it contained an essential truth, is now discarded, for the same individual exhibits sympathetic and parasympathetic manifestations in different situations, and frequently *both are called into play at the same time in a selective manner*. The role of the sympathetic system in the motor expression of emotion of fear and rage has been emphasized by Cannon. The typical picture of profuse sympathetic discharge—the dilated pupils, rapid heart, deepened respirations, pallor, sweating and dry mouth—is characteristic of the behaviour of a frightened individual. But parasympathetic responses are equally observable during emotional behaviour. Secretion of gastric juice and hypermotility of the stomach accompany the sight and smell of appetizing food, but only so long as the vagi are intact. The bladder and rectum may be emptied involuntarily during emotional stress, and the sacral parasympathetic outflow participates in sexual excitement. Wolff's patient, with the large gastrostomy, exhibited parasympathetic responses during a psychological phase of 'suppressed resentment', and recently Gellhorn, Cortell and Feldman have added the conclusive evidence that in the cat, confronted by a barking dog, there is a secretion of insulin which is abolished by vagotomy. It may not be justifiable therefore to interpret types of emotional behaviour in terms of purely sympathetic or parasympathetic responses, for evidently both systems are frequently activated simultaneously.

We turn now for a moment to a more general consideration of autonomic reactions. Somatic nerves, of course, are concerned in the rapid responses of the organism to changes in its external environment. Such repeated demands on the body musculature necessitate continual adjustments in the dynamics of the circulatory system, in respiratory and metabolic processes and in the activity of visceral organs, rapid adjustments in visceral and vascular structures which are brought about by means of autonomic nerves. There is no sharp separation between the reactions in the somatic and autonomic spheres. Visceral and vascular reactions are part of the organism's *total* adjustment to its environment, and probably *every* activity of skeletal muscle, even a slight shift in tonus, is accompanied by changes in the autonomic field. And the reverse is equally true. Increased visceral activity, which occurs during digestion, is accompanied by diminished circulation through the skin and voluntary muscles; and disorders in visceral activity may lead directly to somatic reactions, such as skeletal muscle spasm. Autonomic nerves therefore are in no way independent of somatic. The two are interdependent, a concept which is the antithesis of that expounded by Bichat at the beginning of the last century.

These autonomic adjustments, while allowing for necessary responses of the organism, must also maintain a physiological state adequate for the needs of the tissues. Vascular changes accompanying muscular exercise must take place without appreciably affecting the general blood pressure or body temperature. Otherwise the disturbances would offset any benefit from the particular response. The physiological requirements of any tissue must be balanced against those of all others, and with minor fluctuations, a steady "internal constitution" maintained. The constancy of the "milieu interieur," as Claude Bernard called it, is a condition not of static but of dynamic balance. It is maintained at a price. Forces pulling in opposite directions are equilibrated so as to give an appearance of rest. The condition has been called *homeostasis* by Cannon, to whose extensive studies we owe our present understanding of its delicate balancing mechanisms. *Rapid* adjustments of this kind are the functions of the autonomic nerves. Slower adaptations are, of course, possible through chemical and hormonal influences, so that the autonomic system cannot be considered as indispensable.

An autonomic response, which has been invoked in the interest of homeostatic balance or as an expression of emotional behaviour, may become excessive, giving rise to symptoms which have as sound a scientific basis as any produced by organic disease. The term "functional" which we apply quite appropriately to such illnesses has acquired an unfortunate connotation in ordinary medical practice. There is all too often some implication that the symptoms are "imaginary." It is my belief that many functional disturbances, if sustained, may lead to organic change. In the late stages of Raynaud's syndrome, with repeated vasospasm in the hands in response to cold or emotional stress, ulcerations may appear in the tips of the fingers. More marked trophic changes, of a similar nature, occur in the state of causalgia as described by Weir Mitchell. Haemorrhagic erosions in the gastric mucosa, associated with hypermotility and hypersecretion may follow prolonged periods of emotional tension. Actual pathological changes can therefore be the result of functional disturbances which are frequently only exaggerations of the *normal* fluctuations occurring in physiological mechanisms.

CARDIOSPASM: A PSYCHOSOMATIC DISORDER

EDWARD WEISS, M.D.*

Cardiospasm is a disorder of the swallowing function in which contraction of the lower end of the esophagus is followed by dilatation of the proximal portion, often to enormous size. A variety of terms other than cardiospasm, often based upon the etiologic concepts of the author, occur in the literature. These include idiopathic dilatation of the esophagus, phrenospasm, esophagectasia, hiatal esophagismus, megaloesophagus, simple ectasia of the esophagus, and preventriculosis.

Cardiospasm is not a common disorder but it has an important relationship both to psychological and physical mechanisms, 1) the relation to other functional disturbances of the swallowing function and to the feeding process in general and 2) if evidence were forthcoming in favor of the psychogenic factor in even some cases of cardiospasm it would aid in the establishment of the important concept of the role of psychogenesis in the determination of physical disease.

Probably the first recorded instance of cardiospasm was by Thomas Willis (10) in which he described the vomiting of an otherwise healthy man and attributed it to closure of the mouth of the stomach, either by "Tumour or Palsie." He prepared a rodlike instrument of a whale bone with a little button of sponge fixed to the top which the patient used as a ramrod. By this means the patient fed himself daily for a period of 15 years and was alive and well when the report was made in 1672.

ETIOLOGY

The term cardiospasm originated with von Mikulicz in the 19th century, who thought that the cardiac sphincter was in spasm. However, in an anatomical study by Lendrum (6) no real sphincter could be demonstrated. Nevertheless the term and the concept of sphincter spasm have persisted to the present time. As early as 1888 Einhorn (2) suggested another possibility concerning the pathogenesis of the disorder. He described a case in which he could pass the stomach tube without encountering resistance and concluded that the cardia probably failed to open reflexly during the act of swallowing. Rolleston, in 1896, made the same suggestion independently but it was not until Hurst (3) introduced the term achalasia that the theory received attention.

Many other explanations have been given for cardiospasm. They have to do with changes within the esophagus itself and those which account for the difficulty through the influence of adjacent organs and tissues. Phrenospasm or preventriculosis, the name given to the condition by Chevalier Jackson (4) suggests that constriction of the lower end of the esophagus is caused by contraction of the diaphragm. The majority opinion, however, has been in favor of a neurogenic origin, that is, disease of the vagus nerve or of the myenteric plexus. In Lendrum's (6) series, 10 of the 13 cases with adequate sections showed entirely normal vagus nerves. However, he did find a striking or complete absence of ganglion cells in the plexus and demonstrated that the loss was equally great in the undistended portion of the lower esophagus, which, he felt, argued against these changes being merely secondary to pressure. Therefore he favors Hurst's views that a failure of the sphincter to relax is the cause of the esophageal retention. Nevertheless the prevailing opinion is that both loss of ganglion cells and ulceration of the esophagus are secondary rather than primary changes.

Comparatively little attention has been paid to *psychic* factors in the disorder in spite of the fact that the association of nervousness in patients with cardiospasm has always been recognized. For example, a recent review (8), otherwise comprehensive, dismisses psychogenesis in a sentence. Moschcowitz (7), however, discussed cardiospasm in a study of the psychogenic origin of organic diseases and Winkelstein (11) reported a group of patients with cardiospasm in whom psychic factors seemed to be the chief agents producing the disease. Kronfeld, quoted by Alexander (1), presented some evidence regarding the role of unconscious mental mechanisms in swallowing disorders.

Some years ago (9) I made an effort to enter a little more thoroughly into the emotional lives of patients with cardiospasm, than previous reports indicated had been done, in an attempt to see if some meaning for the disorder could be found from

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the standpoint of behaviour. That report may be regarded as a preliminary statement of which this is a continuation, consisting of a bringing-up to date of some of the cases from the previous paper with the addition of several others. All were referred to me for general medical study through the kindness of Dr. C. L. Jackson of the Bronchoscopic Department, Temple University Hospital. His own views on the subject have been published (5). In all, 17 cases have been observed of which 9 permitted a fairly satisfactory psychosomatic study, and the present report, which does not pretend to be an exhaustive one from a psychological standpoint, is based upon these cases.

CLINICAL PICTURE

There are three common important symptoms—difficulty in swallowing, pain, and regurgitation of food. Food seems to stop before entering the stomach—it apparently sticks beneath the lower sternum. At first the swallowing difficulty may be intermittent with periods of relief of days or weeks. Later the cardiospasm becomes well established with a sense of pushing or forcing of food, with frequent attacks of distress or severe pain following meals. The patient often learns to regurgitate when he is especially distressed.

There is little difficulty in making the *diagnosis* of cardiospasm. The clinical picture is as a rule characteristic. Roentgen-ray studies usually establish the diagnosis by the appearance of a dilated esophagus, with a smooth tapering point of occlusion (Figure I). Jackson believes that esophagoscopy is essential to confirm the diagnosis, because he has found carcinoma in patients who have been reported by Roentgen-ray examination to have cardiospasm.

In the *treatment* of this disorder drugs have been of little use. The most successful measure has been some form of dilatation of the lower end of the esophagus. Since there is danger of perforation from the use of an ordinary bougie, special bougies have been devised for the purpose. These include Hurst's mercury-weighted tube and hydrostatic dilators.

CLINICAL STUDIES[1]

Case 1

A white man of 55, first seen in February, 1933, showed marked cardiospasm and pronounced esophageal dilatation.

The patient gave the usual medical history of this condition. He stated that his illness began about 8 or 10 years before and had become progressive. He had consulted many physicians. Discouraged, he had invested a large sum of money with an osteopath who had promised cure. Finally, when very sick and without funds he had come to the hospital. The previous medical history did not seem to bear upon this illness.

Life Situation. The patient had been "born into the drug business" and had never known anything except the long hours and tedious work of an underpaid pharmacy clerk. He married young and five children came in rapid succession. It was a great financial struggle to look after them. About 1916 or 17 while working very hard he had "some kind of nervous breakdown" which lasted several weeks. In 1922 his oldest and favorite son, then age 20, had just obtained an excellent job which paid well. He gave his salary to his mother and the father was overjoyed with the finally achieved prospects of economic freedom. He had always pictured a great career for this able son and had looked forward to his financial aid in old age.

Without warning one morning shortly afterward he learned that this son had secretly married. He said, "It was the greatest blow I ever received, not only because of the financial part of it but the way he did it." The patient placed his hand on his epigastrium to show where he had felt the blow.

He could not get over this disappointment and even considered having the marriage annulled on the basis that the boy was too young to marry. It is interesting to note, however, that he, himself, had married at the same age. He harbored a great deal of resentment for the girl's parents who, he felt, had stolen his fine son from him. It was during this period that attacks of swallowing difficulty occurred and grew more pronounced and more frequent.

A short time later further aggravation occurred. He learned that his brother in England, whom he described as a ne'er-do-well, was cheating his mother of her small legacy. He went to England, brought his mother back and she made her home with him. It is significant that the mother contributed her whole income to the up-keep of him and his family. In other words, while he accused his brother of having "bled his mother" he, himself, had already borrowed money from her and now took her weekly allowance for living expenses. His altruism in rescuing her from his ne'er-do-well brother seems questionable.

Dream Material. In this regard some psychic material of unconscious origin is interesting in revealing his character. He related two recent dreams. One had to do with the pulling of teeth which reminded him of an old maxim that he would lose a friend. He was very careful the following day in conducting himself so that he would not incur anybody's enmity. Then a dream followed in which he had ordered some coal and was shovelling it in the back yard when he suddenly

[1] Cases 1–5 were the basis for a previous report (9).

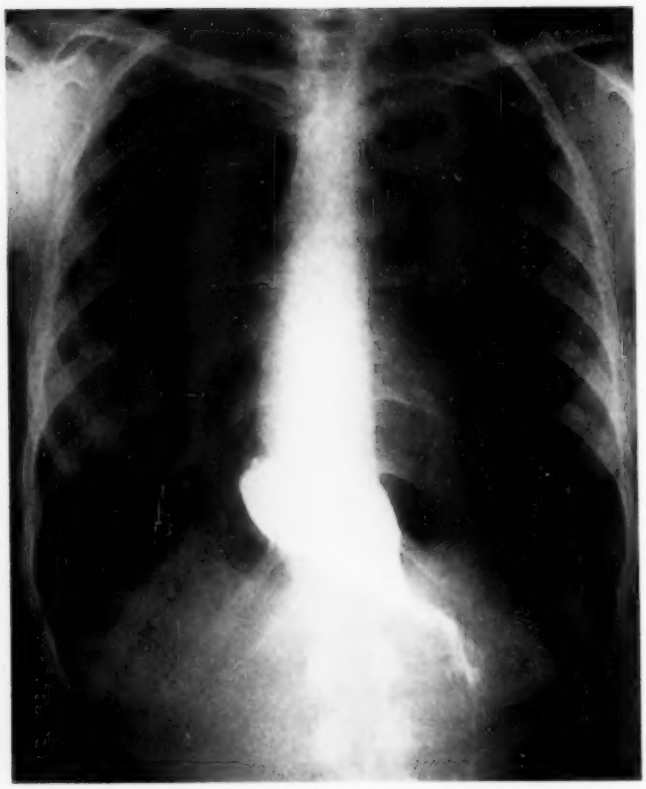

FIG. I. Dilated esophagus containing barium. Note smooth tapering point of occlusion, characteristic of the roentgen-ray appearance of cardiospasm.

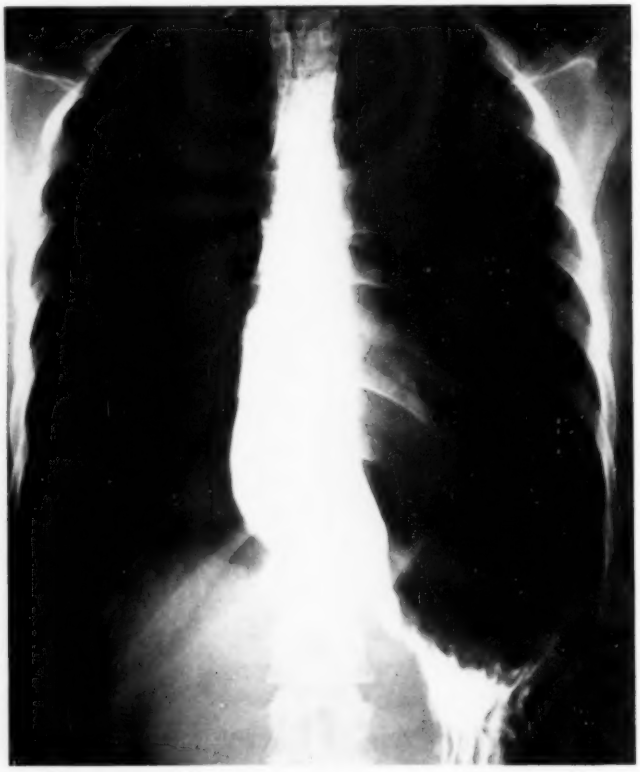

FIG. II. Suggests that more barium entered the stomach in 1940 than in 1939. At the time it was thought that this might indicate improvement. Later studies suggest that this was not significant.

discovered that there was a mountain of coal which belonged to him and in the dream he said to himself, "How foolish of me to be purchasing this coal when I have a whole mountain of it here that belongs to me." He had been thinking prior to the dream of whether it was necessary to purchase coal to last out the winter and wanted to avoid doing so because of his stringent financial condition. He recognized the mountain of coal as representing a lot of money and in connection with it discussed the possibility of inheriting his mother's legacy. This gives even a better understanding of his attitude toward his mother and his fear that he would lose a friend (from the dream before).

The picture we get is that of a meek, submissive and dependent individual who had always worked hard without achieving success, strongly identified with his oldest son in whom he hoped to achieve the success denied himself. With his son's secret marriage came a tremendous disappointment from which he could not recover.

Experience with Osteopath. An interesting commentary in line with my thesis is his experience with the osteopath. He consulted him about December, 1931, and was charged $1,000 "for the management of his case," which his sons had to borrow. It is interesting to consider why he felt like investing this great sum of money with the osteopath. He says, "The osteopath told me that my trouble was due to a spasm arising from a shock" and the patient went on to say to me, "He did not know about my son's marriage." He was much impressed by this diagnosis "because it was the first time that any doctor had suggested that shock and worry might be responsible for my trouble." He thereupon placed his entire confidence and all the money that he could raise in the osteopath's hands.

In the recital to me, accompanied by great emotion this poor druggist made the following significant and perhaps revealing statement, "My son's marriage was a bitter pill that I could not swallow." And who can say that that was not, at least, one meaning of the illness? It would seem, from the resentment with which he speaks of his son's "treachery," that the aggression which this meek and dependent creature would like to have expressed against his son, but could not because of his attachment to him, was turned against himself. However, it is interesting to observe, as frequently happens in neurotic individuals, that this illness did accomplish the purpose of making him dependent upon his son (and mother) as he had been in phantasy, and thus, he actually punished them as well as himself.

Summary. A meek and dependent, middle-aged, druggist developed cardiospasm, apparently in response to a family situation which was "a bitter pill that he could not swallow."

Case 2

T. E., age 25, a very attractive, sensitive and intelligent young woman, was first seen at 15 and had been followed since. She had cardiospasm with pronounced dilatation of the esophagus (Figure I). During the 10 years the course of the disorder had varied somewhat although almost constantly she had had some difficulty in swallowing. In the entire time there were only two periods of several months' duration during which she had been nearly free of discomfort. These will be discussed.

The case was first reported in 1935 as follows:

A white girl, age 18, had swallowing difficulty which began when she was about 15. Just prior to this she had some dental work done and complained of a curious sensation of the teeth which also preceded the original attack of swallowing difficulty. This occurred while riding in a trolley car. Attacks were now accompanied by pain in the chest and salivation. Esophagoscopy and x-ray demonstrated cardiospasm with considerable dilatation of the esophagus.

Life Situation. Early Life. The patient, the youngest child in a family of five, had always been in good health until the present trouble began. She had suffered from enuresis as a child and also from night terrors and formerly was afraid of the dark, imagining a burglar to be in the house. Riding in trolleys always made her car-sick. Menses began a year before the onset of the trouble and were always regular. Frequent interviews failed to bring out any emotional circumstances that seemed significant in regard to her trouble. The financial situation at home was not good and the mother at times was ill but neither situation seemed important in relation to her illness. After many interviews failed to throw light on her problem, quite by chance her mother came to me suffering from a functional gastrointestinal disorder and told a story which seemed significant from the standpoint of her own illness as well as for the patient upon whom I am reporting.

Family Problem. The patient had an older sister who had been a source of great trouble to the family. At the age of 10 this sister began having difficulties at school with truancy and false reports. At 16 she ran away from home (when our patient was 4) was brought back and ran away again at 17 and this time returned illegitimately pregnant and had a child which was disposed of through an agency. The patient was aware of the fact that the sister had had an illegitimate child; she had heard her mother discussing it. Still later the sister married, out of her faith, had another child and just prior to the onset of our patient's illness was being sued for divorce and had returned to her home.

It was then possible to correlate this story with the swallowing problem of our patient who, even as a small

child, was well aware of the disgrace to her family, was very much concerned that nobody in the neighborhood should know of the trouble, and whose swallowing difficulty began about the time that she learned of the divorce action. A divorce, of course, meant that the bad sister would be thrown upon their hands again and endanger their prestige in the neighborhood. This coincided with the period of puberty, when, because of tremendous psycho-physical development, emotional disturbances and their physical consequences are most apt to arise. The whole situation certainly would appear to have something to do with the severe repression of our patient. She, herself, said that her sister's trouble was due to bad companions. In this connection a dream of our patient is interesting: "I was standing between two girls who fell down and blamed me." Falling down is a well known symbol for a moral fall and is over-determined in the dream. Regardless of any further meaning that the dream may have it indicates the thoughts with which the patient was concerned and from which conflict arose.

The cardiospasm apparently indicates the inability of the patient "to swallow" the family disgrace.

Identification with sister. Since this report additional data have been obtained which bear out the original thesis pointing to the relationship between the illness and the influence of the prostitute sister. The condition was aggravated in connection with sexual temptations, as reflected in dream material, and also by situations in which hostility was aroused. Although she consciously recognized that the sister's behavior was a social illness for which neither she nor the family was responsible, her behavior was still dominated by the thought that if the sister would only die the family could at last be rid of the disgrace and freed of the threat of humiliating exposure. Consequently she constantly studied the death notices and listened avidly to the radio to hear of accidental deaths in the hope that one time it would prove to be the bad sister. Nevertheless, her real attitude toward the sister was, as may well be guessed, an ambivalent one and her positive feeling made itself known in the form of pity for a misguided person. A pair of dreams is illuminating in this regard. The first dream, which occurred early in the course of her illness, but to which she still frequently referred because it made such a strong impression upon her, was that she "was dancing on the coffin" of her sister. In addition to the obvious wish-fullfilment, the fact that she was dancing and that she was over the body of the sister suggested her hysterical nature and her identification with the bad sister. In regard to another dream which followed—"Sarah returned, looking natural, and the action takes place in a church"—she discussed her sympathy for the sister and how she wished that it were still possible for her to return to the family fold. These thoughts apparently occurred especially at the holiday season and coincidently her symptoms grew worse. On the street she was constantly looking for the sister and fancied that she saw her in a great many of the women whom she saw, especially if they were "tough-looking." In connection with identification with the misguided sister it is interesting that when her mother wanted to discipline the patient for carelessness she would frequently call her by the sister's name. This was especially true a number of years ago and it was always most disturbing to our patient. It was later learned that she had masturbated until she was about 14 and then she stopped because it made her "like Sarah." It is also probably significant that stopping masturbation and the onset of her illness correspond.

In regard to the latter point, the fantasy that she had when she first developed the attack in a trolley car is interesting. A thought flashed through her mind that she was like Doctor Jekyl and Mr. Hyde because as she felt the curious sensation in her teeth "as though they were getting larger" she was also doubled over with pain and panting, that is, breathing like Mr. Hyde.

A recent experience during an interview confirmed the conflict in regard to her sister. I was trying to point out once more how profoundly her life had been influenced by the sister's behavior and she told how she had prayed fervently for the sister's death. She spoke once more of the dream "I danced on her coffin" and at this point she became dizzy, faint and finally vomited. After vomiting she said her gullet felt clean as though one had cleaned out the nose by blowing into a handkerchief.

Marriage. Conflict over marriage when she was 20 caused an excerbation of her trouble and her efforts to adjust to marriage caused more, although she was fortunate in marrying a man who was devoted to her and most considerate in his attentions. Nevertheless she was frigid, suffered from fatigue and for the first time dysmenorrhea appeared. By the following year she had achieved considerable adjustment in marriage, intercourse was somewhat better, and at the same time her swallowing improved. Then came conflict over the question of having a child and once more her swallowing difficulties were aggravated. A dream occurred about a miscarriage in which something fell out "plop." She frequently described her difficulty as though the food could not get through and accumulated in her esophagus and then after a variable period it suddenly opened and the food "plops through."

Birth of a Child. Finally she decided to have a child, became pregnant almost immediately and a healthy child was born in July, 1941. She was disturbed all through her pregnancy but there were no special symptoms suggestive of the nausea and vomiting of early pregnancy. Nursing was difficult for her; she frequently vomited during the nursing act and finally had to stop. There was great over-concern about the feeding of the child and this continued. Nevertheless the child did well and as her anxiety diminished she again had a lessening of her swallowing

disturbance so that once more in the latter part of 1942 she had a period of good health.

Quarrel with Mother-in-law. A few weeks after the birth of the child a serious quarrel occurred with the mother-in-law. The patient was badly upset and immediately had a severe attack of pain, swallowing difficulty, and vomiting. Ever since she brooded about the quarrel, sought opportunities to renew it and when fresh insults occurred the swallowing difficulty was sure to be reactivated. She was constantly looking for trouble, just as she was constantly looking for her sister. She expressed her hatred for the mother-in-law in these terms, "I can't get her out of my craw."

Reaction to Treatment. In 1943 her symptoms recurred and she was very unwilling to undergo further dilatation treatments. In this regard it is interesting that her reaction to this form of treatment had never been very satisfactory. On one occasion treatment was followed by violent spasm. This was during the period when she was approaching marriage and submitting, with a great deal of guilt, to the approaches of her husband-to-be. She herself likened the treatment to intercourse as well as to passionate kissing. Her dreams of this period concerned prostitution, with many references to her sister.

One more aspect of her treatment—she was even less successful with self-treatment. That is, when she was furnished with a bougie to dilate herself she had less success than when she submitted to treatment at the hands of a physician. It seems likely that guilt over self-manipulation was a factor here because of her sexual fantasies.

Psychosomatic Illness in Other Members of the Family. The remainder of the family are likewise interesting from the standpoint of psychosomatic illness. The mother had pylorospasm which seemed to depend upon the same family problem. Sarah's child was turned over to an agency for disposition and was placed in a foster home. The mother remained very ambivalent toward this child and was forever trying to see it with the idea of bringing it home and at the same time was content that "this reminder of her failure to raise a better daughter" was not constantly before her.

A brother of the patient suffered from ulcerative colitis which also seemed to have an emotional relationship to the same problem. He was accepted into the military service and is at present invalided in an Army hospital because of an exacerbation of his colitis.

Still another brother disturbed the family by his difficulties in getting married. For years he wrestled with the problem, which was related to impotence. He at last married—how successfully I do not know.

A last child, a daughter, seemed quite healthy except for constipation.

Summary. A case is reported of cardiospasm in a young woman who had been observed for 10 years since its inception. There was early evidence of a neurotic personality. The disorder began at puberty, at first intermittently, and gradually developed into persistent cardiospasm with esophageal dilatation. Response to dilatation treatment was unsatisfactory.

Her psycho-sexual development had been profoundly influenced by a prostitute sister, with whom she unconsciously identified herself—the result was a conscious repudiation of sexual interests. Circumstances touching upon this conflict seemed to influence swallowing function. Upon a superficial level the disorder seemed to mean "I cannot swallow this family disgrace." On a somewhat deeper level it seemed to represent the hysterical reaction to very powerful oral aggressive impulses. This was illustrated by her use of the expression, in regard to great hostility concerning her mother-in-law, "I can't get her out of my craw."

The mother and a brother had psychosomatic illnesses which seemed related to the same family problem. Another brother was impotent and had a conflict over marriage so that there seem to be physical representations of this particular emotional problem in at least four members of a family of six.

Case 3

An unmarried school teacher, aged 30, complained of stomach trouble and swallowing difficulty, of about 6 months' duration. She always had been constipated but had had no previous serious illness. She had lost 28 pounds since the onset of the present illness. Other than the poor nutrition, physical examination was negative. Esophagoscopy and X-ray showed cardiospasm but no dilatation of the esophagus. In treating the patient Dr. C. L. Jackson found that she did not tolerate the dilator well but it was felt that there had been some response to dilatation and the patient wanted the treatment.

Life Situation. The patient was a middle child in a large family the medical history of which threw no light on the patient's illness. The family was described as a religious one and two sisters married ministers. The patient stated that she was a normal child; that she had had no behavior difficulties except an occasional nightmare.

Menses was established at 14; periods were always regular and never associated with pain until recently. She attended normal school and college, fitting herself as a teacher. She then obtained a position as a high school teacher in another city and developed many cultural interests in addition to her teaching. She was a very industrious person seeking constantly to improve herself and widen her outlook.

She was not interested in boys, nor did she develop any such interest until she went to college. She grew up with the idea that it was improper for parents to have intercourse except for the purpose of having a family.

Sexual Conflict. Several years before she began to receive attentions from another teacher in the school,

a man thirteen years her senior, who had separated from his wife and was about to obtain a divorce. Even before his divorce was granted, he suggested marriage but her family objected. This took place in the summer three years ago and she recalled that she suffered some indigestion coincident with the receipt of the letter from her family objecting to the proposal. Subsequently he frequently suggested marriage but for one reason or another she held off. The reasons stated by the patient did not seem satisfactory for this long postponement of marriage. During this period her suitor was persuading her to have intercourse on the basis that it was a necessary test for marriage. The patient had no sexual desire and had many moral scruples against intercourse. However, she gradually overcame them and finally submitted but with great fear of becoming pregnant. About the same time she developed dysmenorrhea and had one rather severely painful period. She also noted an increasing irritability. A menstrual period began on February 8, 1933, but stopped two days later and she promptly considered herself pregnant and with this a severe attack of indigestion began. The indigestion was immediately followed by difficulty in swallowing. She entered a hospital and remained about three weeks without benefit. So great was her fear that in spite of the fact that her menses returned she continued to believe herself pregnant, suffered from morning nausea and vomiting and stated that her abdomen was swollen and hard "just as though there was a baby inside." In April her physician stated that he would have to make a gynecologic examination and this exaggerated her fear of pregnancy. During this whole period she had many arguments with her suitor and at times felt that she would lose him and this, of course, added to the humiliation of the supposed pregnancy. On one occasion he was supposed to visit her but wrote saying that he would have to postpone his visit. Immediately she had an exacerbation of her swallowing trouble. And it was just following this episode that Dr. C. L. Jackson reported, after an attempted treatment, "the esophagus failed to relax; the crico-pharyngeal pinch-cock was tightly closed. The patient does not tolerate the dilator well." Now, in addition, each menstrual period was associated with an increase in swallowing trouble.

The picture we get is that of a sexually inhibited (frigid) girl who had great difficulty in bringing herself to marry, maintaining a long engagement, finally yielding to intercourse, probably persuaded by the threat of losing her man whom she was afraid to marry and afraid to lose. Finally her guilty feelings culminated in an ill-founded idea that she was pregnant, because of a disturbance in her menstrual period, and then indigestion and swallowing difficulty occurred and persisted. So exaggerated was her fear of pregnancy that it was maintained in spite of subsequent menstrual periods, and thus we obtain some insight of the degree of fear and how powerful its influence might be in affecting the functions of her body.

Summary. In this case cardiospasm occurred in a young woman with repressed sexuality in whom an obvious and easily ascertained conflict over marriage and sexual transgression seemed to act as the precipitating factor.

It is not at all unusual for young women to influence their menstrual periods by emotional disturbances arising in connection with the idea of pregnancy, but it is unusual for the fear and guilty feelings to be as pronounced as in this patient. This could only occur in a person with pronounced sexual inhibitions. Apparently this sexual transgression, which would not have provoked such symptoms in an average girl, called for an unusual degree of self-punishment in this patient.

Case 4

A white girl of 19, was first seen in July, 1933. The cardiospasm, with evidence of some esophageal dilatation, was of three years duration. The previous medical history did not seem important in relation to the cardiospasm.

Life Situation. The patient described herself as a spoiled child (because she was an only child until the age of 12), who suffered from temper tantrums but did well in school. She was devoted to her father but did not get along well with her mother who, she said, possessed a bad temper. She was strongly under the influence of her very religious father who had difficulty in declaring his allegiance to any one church because of his failure to find complete satisfaction there. At the age of ten she was sent to the Sunday School of the religious organization to which her father became a new adherent. She could recall even at this early age attending a revival meeting and subsequently having religious doubts about her own "feelings." Already she possessed the ambition to become a missionary. All through high school she had grave doubts of a religious nature. Then, during her senior year she was unable to decide what college to attend. She wanted to go to some "modern" school but feared that it would possess a "jazz" spirit and this was at variance with her religious belief, which was to forsake worldly pleasures, such as dancing, cards and the theatre.

Conflict over Religion. About this time her father brought her difficulties to a climax by talking to her "on the necessity of becoming a true Christian—I had become old enough at 16." She was terror stricken by her father's conclusion and pretended, by reading a book, that she did not hear what he was saying. It was at this time that her swallowing difficulty first appeared.

She finally chose a conservative college but while there a very severe attack of swallowing difficulty occurred in connection with the idea of engaging in college dramatics to which she had been very devoted. Her reason was rather fanciful but none the less valid

(as was easily apparent from her attitude in our discussion) that is, she feared that if she became successful in dramatics it would offer her the additional temptation of a successful stage career. And so she thought "I cannot take a chance of becoming a dramatic success, then I could not be a Christian." The situation was the same as before, that is, a conflict between freedom and the straight and narrow path of her (and her father's) religious beliefs.

In this case cardiospasm arose in a girl with a pronounced emotional conflict over the question of religion. The swallowing difficulty occurred when the conflict was at its height and was aggravated when psychic situations touched her emotional problem. She told me that shortly after she developed the illness she thought that she could resign herself to it "because it was intended by the Lord." She looked upon the illness as something outside of herself, for which she was in no way responsible, and felt quite hopeless about treatment. She thought the disorder would disappear "when He willed it so." She was very touchy on this religious question and resented any implication that a conflict existed in her and that her swallowing difficulty was the answer to that conflict, for it would seem that the symptom served several purposes. As she, herself, expressed it, "it served the useful purpose of keeping me away from a 'jazz' school and led me into the proper path of the true religious faith." At the same time it was a protest against the harshness of this straight and narrow path and was also the inner revolt of a mild and passive creature against the father's religious fanaticism. More than that it punished her for thoughts of digression but, at the same time, succeeded in evoking her father's sympathy, whose devotion she so much desired.

The father, too, considered his daughter's condition "beyond human help." Nevertheless, he continued to send her for treatment and constantly sought advice and opinion regarding her condition.

It also must be apparent, from her resigned attitude toward the illness and the purposes that it seemed to serve, that mechanical treatment alone could hardly hope for success. Indeed, so necessary did the illness appear to be for a partially satisfactory adjustment of her emotional life that to take it away without preparing her psychologically might have resulted in its being replaced by a more serious condition, as apparently happened in the next case.

Summary. In this case cardiospasm arose in a girl with a pronounced emotional conflict over the question of religion. The swallowing difficulty occurred when the conflict was at its height and was aggravated when further psychic situations touched her emotional problem.

Case 5

A young white man of 30, first seen in July, 1933, complained of difficulty in swallowing and vasomotor rhinitis. Esophagoscopy and X-ray showed pronounced cardiospasm with a greatly dilated esophagus. The swallowing difficulties had begun many years before (in puberty) and had continued intermittently for several years with a severe attack about the age of 17. In recent years his difficulties had been very persistent.

Life Situation. The patient was an only child who described his father as a quiet, plain person, much older than the patient's very excitable mother. The parents never got along well and separated for a period when the patient was about six years old.

His reaction to his mother had constantly been an antagonistic one. He considered his mother a "neurotic who had temper tantrums and took them out on me." He recalled that riding on the train at about this time aggravated his swallowing symptoms. At 17 he went away to school where he was very unhappy. He had a "nervous breakdown" and was in a sanitarium for 5 weeks. His mother then came to spend a vacation with him and they went to a high altitude together after a bad night of travel. According to the patient there was a combination of fatigue, mental depression, the high altitude and the presence of his mother. All together he held them responsible for a severe attack of swallowing difficulty, so that he could not get any food or even liquid down. He was rushed to a nearby city where X-ray studies were made and a diagnosis of esophageal obstruction established. From then on various treatments were attempted—gastric lavage, passing of sounds and the administration of atropin.

Vasomotor Rhinitis. Frequently during his early years he suffered from what he called bronchitis and then in 1931 the attacks were replaced by vasomotor rhinitis.

Impotence. During his adolescence he was constantly disturbed by sexual worries of one nature or another (masturbation and on two occasions homosexual experiences) and at about the age of 24 he attempted intercourse with an older woman but suffered premature ejaculation. After frequent attempts at intercourse and constant failure he consulted a genitourinary specialist who treated him by massage of his prostate and the insertion of sounds. He constantly brooded about his sexual life and gave the impression that his whole life, from puberty on, had been devoted to the purpose of accomplishing sexual intercourse successfully. Relatively speaking he seemed little concerned about his esophagus. What did tremendously concern him was his impotence which he spoke of as his "sexual weakness." So profoundly was he affected that he had little energy left for his job and performed routine duties in a very perfunctory way. He seemed as little concerned about the job as he was about his esophagus. The lifelong disturbed relationship to the mother, the difficulties in the sexual sphere, the lack of ambition in his job despite a good intelligence, and his unhealthy relationship to men in general were certain indications of a neurotic personality.

The conflict thus is seen to be of deeply rooted origin and seemed to manifest itself in several different systems, respiratory (vasomotor rhinitis), gastro-intestinal (cardiospasm), and genital (impotence), as well as in the total personality. The specific psychic meaning of the various physical disorders is not clear but it must be apparent that to treat the cardiospasm simply by mechanical dilatation would be just as short of complete medical management as was the passing of sounds in the treatment of the impotence.

The patient was referred for psychoanalysis which he was able to continue for about seven months (interrupted by the war) at the end of which time he reported considerable improvement.

Summary. Cardiospasm began at puberty in a young man who also presented other psychosomatic disorders—vasomotor rhinitis and impotence. He had definite indications of a neurotic personality. Psychoanalysis seemed to help him.

Case 6

I. D., age 32 (1935) presented evidence of cardiospasm, confirmed by x-ray and esophagoscopy, with a moderate degree of dilatation of the esophagus.

There had been no special illness or behavior problems in childhood and his first difficulty was a little less than two years before when he experienced heartburn. After a few months swallowing difficulties began. The attacks occurred especially indoors, in the movies, in the subway and at night in bed. The attack would begin with a burning sensation beneath the sternum followed by restlessness and sweating.

The father had always had stomach trouble and a diagnosis of ulcer was made some 15 years before. The mother, too, had a poor digestive system. The younger brother, in good health, he considered "a radical who specializes in psychology."

Life Situation. The patient came of a well-to-do family and "had never known insecurity" until about two years before when for the first time he experienced financial difficulties. He suffered a cut in salary, had to move to cheaper living quarters and, according to his statement, his wife had difficulty in making the financial adjustment. Then, also because of financial difficulties, his father-in-law committed suicide. The patient had gone to bed one evening with a slight cold, had taken some medicine to make him perspire, and then had been wakened about midnight, told to go to the office and there found the dead body of his father-in-law hanging and it was necessary for him to cut the body down. This represented tremendous emotional and physical strain and "I almost choked myself in taking the body down." From that time on his swallowing difficulties increased.

He was sensitive and easily hurt and prided himself on his independence. The threat of financial insecurity and the humiliation of accepting help from his father with whom he had a difficult relationship seemed to perpetuate his trouble.

Summary. Financial insecurity and a dependent personality, with conflict aggravated by a family tragedy (suicide), were apparently related to this case of cardiospasm.

Case 7

R. R., 39, married, a well nourished, rather attractive white woman, was studied in 1940.

She reported that she had been under care in the Jackson Department for 5 years for cardiospasm and had been helped by dilatation. The diagnosis had been established by x-ray and esophagoscopy.

Two years before she had several teeth removed and on coming out of gas anesthesia she had a wonderful feeling that she was cured!

Life Situation. Her father was a miner who was hurt when the patient was 13. His leg was badly broken; he was unable to work for a long time and received no compensation. Therefore, the patient, who was one of nine children, was sent to Philadelphia to live with a married sister. She married at the age of 25 and soon had some difficulties with her mother-in-law. "I have nothing to do with my in-laws who resent me."

She had always been interested in improving herself. She complained that for the first 12 years of her married life her husband kept her from going out—"he was so possessive." She had to wait until her children grew up so that older ones could take care of the younger ones before she was able to go out but since that time she made an effort to improve herself by joining in various social activities and clubs for improvement of mind.

Then difficulties arose with her sister. She lent money to one of them and when she became pregnant and wanted private care at the hospital, "which I had been used to," she could not get her money back. From then on she did not speak to her sister for four years although they lived next door to one another. When talking to a neighbor about the sister, the patient felt a sudden catch in her throat "which was the beginning of my swallowing trouble." Then she added "I really can't blame it all on my husband's family."

The first real evidence of trouble was a "choking sensation" in the early part of her fourth pregnancy which she felt was due to her husband striking her by chance during the night in her swollen breast. At first she had the idea that she might have cancer and she still continued to think of that diagnosis at times. "No one has ever told me differently." She lost this pregnancy in the sixth month and after that had a "terrible fear" that the next child would be born without an esophagus or would inherit cancer from the patient. It is significant that she blamed the trouble on her husband even in the first interview because in her last interview several months later she again placed the blame upon him but in a somewhat different way.

She brought her youngest child with her for the inter-

views and had a great deal of trouble with him—she called out in a whining voice for him to behave. She said, "I cannot fight with the children because it makes me sick." She impressed one as a soft, dependent and passive creature with a great deal of inner hostility.

In her last interview she placed the blame upon her husband for her condition and said that many times she threatened to leave him except for her children. She had a great deal of hostility for him because he flirted with other girls and then came home and "expects sexual relations with me." On one such occasion she was especially humiliated and never forgave him.

She was not eager to continue her visits to me and on more than one occasion hinted that it was too difficult for her to come to the out-patient department. Finally she asked to be relieved of this necessity. Apparently she felt that she was repaying the hospital for what they had done for her by coming to see me—"giving something in return." The Jackson Department referred to her as a very good patient, saying that she was most obedient about keeping her appointments and was very cooperative. As is well known this frequently happens in people who comply on the surface but are defiant underneath.

Summary. Typical cardiospasm occurred in a compulsive, frigid, dependent woman with a great deal of unconscious hostility, particularly for her husband.

Case 8

H. S., 19 (1941) had swallowing difficulty for one year. Trouble began gradually with a sensation of food sticking and this was followed by pain in the substernal region. He described the attacks as a pressing sensation in the epigastrium or under the lower sternum and then the sensation passed up into the throat and finally he felt it "coming out of the ears." The pain started gradually and built up and then gradually died down, lasting perhaps for five minutes. He lay down if possible during the attack.

X-ray showed mild but definite cardiospasm confirmed by esophagoscopy.

Life Situation. There was nothing remarkable in the past history except that he had whooping cough at two and then, according to the mother, vomited for the next five years. There was considerable loss of weight and irritability and he was "not the same child." At seven he improved greatly and was "a different boy" from then on. Headaches and vomiting occurred again at the age of 12 or 13, and at 15 he suffered from acute appendicitis for which he was operated upon. After that there was no more vomiting although he occasionally still had headaches.

He had acne for several years and attributed some of his shyness to this. He thought one of his chief problems was his awkwardness in dancing which made him shy in the presence of girls. He never masturbated and had further evidence of inhibition in the sexual sphere but it was not felt wise to disturb an adolescent, reserved and compulsive personality beyond a certain point. Due to the circumstances of his coming, a personality outline was used in his psychosomatic study but it proved inadequate for the purpose.

He was very worried about the future and especially anxious in regard to money for his education. Conversation with the mother brought out the reasons.

The mother was about 20 when she married and her husband a year or two older. She became pregnant shortly afterwards. During the depression they "lost everything." They dug into their savings, their life insurance policy and even sold their belongings in order to keep going. This was when Herbert was about 9 or 10 and the mother had to go to work, and take care of the home too. She was always tired and irritable and never had much time for the children.

Apparently Herbert was much influenced by the difficulties at home. Now he was an irritable and worrisome boy without the joy of life that a boy of his age ought to have, always trying to save money and very critical of the way money was spent at home. The home was not as he would have liked it to be—for two years they lived without paper on the walls; the mother always intended to do something about it and then something else turned up for which they had to spend their money. They would not borrow because they did not wish to be in debt.

Summary. Cardiospasm occurred in a young man with an early history of gastro-intestinal difficulties. He was a "depression child" and his personality was apparently much influenced by the financial stringency of the home. The whole problem of his social adjustment seemed related to his swallowing difficulty. His reserved and compulsive character did not lend itself to psychosomatic study by means of a personality outline.

Case 9

Mrs. J. D., age 39 (1940) complained of difficulty in swallowing, pain beneath the sternum and regurgitation of food. The diagnosis of cardiospasm had been made six years ago but symptoms had been present for twelve years. Menses had always been painful until her marriage in 1928. Since that time there had been only slight discomfort. Her mother and a maternal aunt had died of cancer. The general physical examination showed no evidence of organic disease but x-ray and esophagoscopy confirmed the diagnosis of cardiospasm.

Life Situation. The patient's mother died when she was 15. She remained at home keeping house for her father until she was 22 when she took a position in another community. She found the responsibility heavy, lost weight and did not feel well. Then she met the man she was to marry. They were engaged in four or five months and it was during this period that she developed pain in the epigastrium which extended

to the lower jaw and teeth. A diagnosis of "fallen stomach" was made and a corset recommended. She gave up her position and married in October. She became pregnant in December and in the sixth month of pregnancy had a bad fall which frightened her but her pregnancy continued to term with the birth of a healthy child.

Two years later in October the second child came and following this there was much difficulty in swallowing with attacks of choking. This she considered the beginning of the present trouble.

Two and a half years later she had a third child, six at the time of this report. It was when this child was two months old that she suffered so many symptoms that she consulted a physician in a near-by city and the diagnosis of cardiospasm was made. Treatment by dilatation was started and she was furnished with a tube to use herself, which she did for about six months but "it made no difference to my trouble."

September (1939) she missed her menstrual period and then in the middle of October there was an excessive menstrual period which she thought was a miscarriage. She was examined by a physician who thought she had a tumor and recommended an operation or "the process might become malignant." She then became concerned about cancer, "like my mother", and also inquired whether cardiospasm might turn into cancer.

Because of religious reasons she had never taken contraceptive precautions and consequently felt that she had been thin and run down because she had had children in such rapid succession. Her physician said "she gave everything that she had to her baby."

After reassurance that she did not have cancer and that emotional factors could have had much to do with her illness she brought herself with the greatest difficulty to talk about her feelings.

Marital Incompatibility. She came of artistic people. Her mother did not want her to be raised on the farm because she couldn't be properly educated culturally. Her father was a southerner of the old school, very romantic and very sentimental, with all of the nice manners of a true southern gentlemen. Lack of money prevented her from enjoying the things in life that she wanted; she couldn't be educated; her father apparently wanted her at home after 1 year of schooling (thus she lauded him on the one hand as being courtly and thoughtful and on the other hand implied that he did not do right by her as far as her education was concerned, "of course he could not because he did not have the money"). Then she became engaged to a rather crude, rough, plain person whose people were very different from hers. When she went to visit them the summer she became engaged the manner in which they received her caused her "to cry her heart out." That was the summer during which symptoms arose. Then she found herself normal during the first year of their married life, even more normal than her husband, but since her first baby arrived she had not been able to respond. She found her husband unromantic, unsentimental, and lacking in the fine, sensitive qualities she appreciated. Now it made no difference, she resigned herself to the situation, and gave everything that she had to her children. She lived entirely for them and wanted them to have the things in life that she had missed. She attributed much of her frigidity to the fact that her husband had always suffered from premature ejaculation.

The most recent problem had been the question of further pregnancies. She could not practice contraception and it would not relieve her of responsibility even if her husband did; she would be a party to the act. She did not believe in the practice of rhythm because that was giving in to the animal instinct and she felt that this should play no part in the sublime act of intercourse. It seemed that this was only a rationalization for her unsatisfactory sex relationship. I assured her that she was not unique in this respect although she thought she was. I told her that many women have this difficulty and many men too and that in both psychic influences are responsible and that recovery is possible. More than the above she had in the last year been particularly afraid of cancer of the womb because a physician told her she had a condition which ought to be remedied or it might turn into cancer. He said, "if you come back in a year with cancer, don't say that I didn't warn you." Hence, she suggested that this was another reason why she didn't want to chance pregnancy and therefore she had had no sexual relationship with her husband since the last summer. Our examination found only a laceration of the cervix which could be easily repaired by fulgeration. She regarded herself as a very sensitive, fine person of artistic leanings who never had a chance to develop her artistic possibilities, who was married to a crude, and unromantic son of the soil. She hinted that she would like to have an extra-marital affair but realized that it would cost her a great deal in guilty feelings.

In this connection it is interesting that treatment with the dilator at the hands of a woman physician on our staff was followed by a poor response but the same treatment at the hands of a man physician resulted in considerable improvement.

Summary. This case of cardiospasm apparently arose in connection with marital sexual incompatibility.

DISCUSSION

Cardiospasm is a psychosomatic disorder. It is important to emphasize that just as in other psychosomatic disorders connected with the vegetative nervous system, the psychic factor is not the whole problem. The very fact that this disorder has been described in children in the first few days of life definitely excludes the psychic factor as being present in all cases. There is undoubtedly an

inherent tendency, a predisposition, to which the psychic factor is complementary and it must be that both together, in the majority of cases, are necessary for the development of cardiospasm. If we look upon the problem from the standpoint of a curve of probability, at one end will be cases which are wholly physical in origin and at the other are instances which may be largely psychological in origin, but the great majority are probably dependent upon both interacting factors. It is constantly necessary to emphasize this point of view in teaching psychosomatic medicine in order to overcome the solidly entrenched "either—or" etiologic concept of organic medicine.

Cardiospasm usually is found to arise coincidently with an emotional conflict, in many instances during puberty, in an individual whose early life gives evidence of personality difficulties. Other evidences of neurosis or other psychosomatic disorders are frequently present and are also common in other members of the family. As would be expected parent–child and sibling relationships are seriously disturbed. At first cardiospasm often seems to manifest itself intermittently; later on, it may become permanently established. Exacerbations occur which frequently can be correlated with fresh psychic insults touching the particular complex of the individual. These points are best illustrated by case 2, which was followed for the longest period.

It seems to me that the cases cited are organ neuroses, corresponding to a form of conversion hysteria deeply rooted in the unconscious mental life of the individual. The physical disorder represents symbolically the unconscious conflict—it appears to be a compromise between the gratification of certain impulses and their rejection by another part of the personality. Superficially an important meaning of the disorder can often be stated in such simple terms as "I cannot swallow that situation" (Case I). Therefore, this meaning can often be discovered by looking (psychologically) for the situation that the individual "cannot swallow." After the patient has been assured that no other cause can be found—cancer, for example—this kind of an approach will often lead to a discussion of important emotional factors.

On a somewhat deeper level the disorder seems to represent another tendency, that is, an aggressive desire to incorporate some object with resultant spasm or inability to relax the lower end of the esophagus. The sexual, hostile and self-punitive aspects of this disorder are brought out in the various cases that are reported.

Whatever one believes regarding the etiological role of these mental forces, it must be apparent that to study patients with cardiospasm simply as physiological mechanisms and treat them by mechanical measures without making some effort to understand the emotional make-up, is a very one-sided and inadequate attempt to deal with the disorder. The above observations suggest the necessity for a combined physical and psychological study and treatment of the individual patient with cardiospasm. No one can deny the necessity for mechanical treatment in the established case of cardiospasm but it seems possible that this additional psychic approach will help us deal with that group of cases "who do not tolerate the dilator well" (Cases 2, 3); the cases who get no benefit from self treatment (Cases 2, 9); a group "which tend to recur" or the group "which cannot be cured." Especially in regard to these groups we must consider the frequent observation that in a patient with a severe neurosis a physical disorder (such as cardiospasm) appears to be that patient's solution of his psychic conflict. The physical disorder, therefore, is necessary to the emotional life and until the psychic conflict is better solved, the particular disorder from which the patient suffers either must be maintained or must be replaced by another illness. In Case 5 dilatation treatment was immediately followed by depression. Certainly, in an early case of cardiospasm, especially in a young person, psychologic study and treatment seem to me an essential part of the management. Indeed, I venture to suggest that the time is approaching when the physician will consider the neglect of psychological study just as serious an omission, in the total study of the patient with cardiospasm, as the failure to x-ray such a patient or study him with the esophagoscope.

SUMMARY

Cardiospasm, a psychosomatic disorder, is an organ neurosis, corresponding to a form of conversion hysteria deeply rooted in the unconscious mental life of the individual. It arises coincidently with an emotional conflict, in many instances during puberty, in an individual whose early life gives evidence of personality difficulties. Other evidences of neurosis or psychosomatic disorders are frequently present in the patient or his family. At first cardiospasm often seems to manifest itself intermittently; later on, it may become perma-

nently established. Exacerbations occur which frequently can be correlated with fresh psychic insults touching the particular complex of the individual.

Nine cases, out of a total of 17, permitted psychosomatic observations. These clinical studies are reported in some detail and suggest the necessity for a combined physical and psychological study and treatment of the patient with cardiospasm.

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THE CLINICAL SIGNIFICANCE OF EMOTIONAL DISTURBANCES AFFECTING THE STOMACH, DUODENUM AND BILIARY TRACT

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The effect of emotional stimuli on the gastrointestinal tract has opened up a new field for gastroenterologists. We can no longer dismiss the clinical picture of a patient with a simple and noninformative diagnosis of "nervous indigestion." We find ourselves at the crossroads. Thorough laboratory and roentgenologic investigation may leave us in the dark as to the patient's illness. Usually there are no definite findings to justify an exact organic diagnosis. Therefore, we must turn to new avenues of approach if we are to accept the well defined dogma that "things don't just happen." It is fortunate that the gastrointestinal tract affords a fertile field for this investigation. The abundant clinical material, the frequency of complaints referable to the digestive organs, laboratory and roentgenologic control, all give us a solid foundation on which to build. That the digestive tract should be the seat of altered emotional response is best explained anatomically on the basis of its abundant afferent and efferent nerve supply. The ease of transmission of emotional stimuli from the hypothalamic region to the digestive organs is a common observation. Furthermore, there is no other vital function which from early life plays such an important role in the emotional household of the individual as eating. The relief from physical discomfort that the infant experiences while eating and the satisfaction of hunger become deeply ingrained in the child, being associated with a feeling of well-being and security. In addition, feeding is tied up with a feeling of being loved. To the child, feeding and love become inseparable. This oral-receptive manifestation in early infancy is the natural emotional state of the child. If it persists in later life, it must be suppressed, because it is not harmonious with independent adult life. The repressed oral trends may produce a disturbed function leading to changes in the physiologic equilibrium. The stomach may reveal this evidence of disturbance by becoming red, turgescent and edematous; it may be thrown into various spasms and become hyperirritable, and changes in the secretory apparatus may become manifest. If the mechanism goes on unabated, permanent changes may ensue. The patient, not cognizant of the deep emotional factors, blames the intake of food. He suffers from various phobias of indigestion. The symptoms may be variable. Yet while they may represent the classic syndromes that have been laid down in the past for definite clinical entities, thorough laboratory and roentgenologic investigation will fail to reveal any noteworthy abnormality. The gastroscopist calls the condition "gastritis." But is this really an inflammatory process, or merely the end-result of hyperfunction? One may have some hesitancy in speaking even of atrophic gastritis as an organic disease in the absence of known cause. Atrophy can be the result of hypofunction. Likewise, hypertrophic gastritis may be the result of hypertrophy and hyperplasia similar to that seen in other organs in the presence of hyperfunction. Anyone familiar with the roentgenologic picture of the stomach should be convinced of the logic of this premise. Even gastritis with pylorospasm when there is no known cause falls into the same category. Therefore, in the absence of organic disease one must search for possible altered function resulting from emotional stimuli reaching the stomach.

When one excludes ulcer, malignant change, vitamin imbalance, anoxia from liver or cardiac disease, infections, parasitic disease or diseases of metabolism, there still remain stomach symptoms which must be explained. No more evidence is needed than the large number of gastric disturbances seen among men in our armed forces, who are all presumably healthy young persons without known organic disease. Psychodynamic factors causing hunger contractions, hypermotility or relaxation and dilatation of the stomach must be carefully evaluated. Hypersecretion, either acid or mucous, or hyposecretion unless associated with known organic disease may fall into the same category.

Therefore, it is reasonable to expect that the large group of patients with a predisposed irritable stomach will show many bizarre clinical pictures with the intake of food. Only a careful, pains-

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taking psychiatric history reveals clues as to the possible source.

What has been said of the stomach applies also to the duodenum. Disturbances of motility, changes in the lining and reflex manifestations related to the duodenum become clarified. So-called duodenitis in the absence of ulcer or cholecystitic or pancreatic disease gives rise to new interpretations. The hyperirritable duodenum which roentgenologically shows early emptying, with various and bizarre configurations fitting into no definite pattern for organic disease, may have its origin in the vegetative nervous system. The complete relaxing effect here of atropin or drugs affecting the smooth musculature is similar to that observed in the stomach. This manifestation has escaped the interpretation that the disburbances in configuration had emotional stimuli. The altered pattern of the duodenum causes reflex gastric manifestations. Duodenal stasis, which may be the result, frequently is associated with gastric dilatation, causing negative pressure. The air is sucked in through a patent cardia, and the patient complains of fullness and distention. The overdistended stomach frequently exerts mechanical pressure on the retroperitoneal portion of the duodenum, increasing the duodenal stasis. This vicious circle produces marked discomfort after eating, which may become unbearable to the patient. A sudden emission of air, which the patient refers to as belching, immediately reduces this overdistention; the pressure is relieved on the retroperitoneal portion of the duodenum, and it assumes its normal tone. The patient's discomfort is relieved, and he has a definite feeling of well-being. Thus the afferent stimuli from the abdomen are suppressed. This conscious part of the vicious circle is markedly lessened, and emotionally he becomes temporarily more stable.

This sequence of events is a commonplace observation, yet heretofore gastro-enterologists have classified this symptom-complex under various headings, giving various diets and medicines. That we can produce temporary relief by these measures goes without saying, but what about the permanent relief? What about the eradication of those etiologic factors which have been so long a thorn in the side of the pure organicist? Patients presenting such a picture comprise a large proportion of those one sees in an office and hospital practice. Many of them are given a diagnosis of gallbladder disease. Because of the similarity of symptoms one might presuppose this conclusion justified.

In another large group of patients, the symptoms are referable to the upper right quadrant of the abdomen. The so-called dyspepsia, in which the symptom complex of gallbladder disease is an important component, has been brushed aside too lightly in the past. We have now come to suspect dyskinesia of the gallbladder, which has been classified by Westphal as follows:

1. Hyperkinetic.
   (a) Hypermotile. Increased mobility of the gallbladder with rapid emptying in response to fat.
   (b) Hypertonic. Contraction of the gallbladder against spasm of the sphincter, with spastic distention and mild colicky pain.
2. Atonic.
   Relaxation or atony of the gallbladder with spasm of the sphincter, causing atonic distention of the gallbladder with mild continuous heavy aching sensation or sensation of tumor.

According to Ivy, the vagi carry afferent impulses responsible chiefly for anorexia, nausea and vomiting when the gallbladder and ducts are distended. The splanchnic nerves carry pain impulses when the ducts and gallbladder are distended. Gastric flatulence is not likely to be due to gastric anacidity and fermentation, but is due to the loss of tone of the gastric musculature and to aspiration, or swallowing of air, which Ivy has demonstrated by the proper distention of the gallbladder in dogs.

With these facts in mind, the function of the gallbladder in man can be studied by cholecystography. A normal gallbladder fills about 12 hours after the oral administration of the dye. In another two to three hours it concentrates and becomes somewhat smaller. Then after a standard fat meal at the end of one hour, it contracts to one-half to one-third its previous normal size. At this point appear the roentgen deviations from normal which may be classified as dyskinesia. The mechanism of this dysfunction, in the absence of such known etiologic factors as duodenal ulcer, so-called chronic appendicitis, diverticula of the colon, pelvic disease in men or women and urologic disease, has been little understood. A simple organic explanation of this disturbance within the biliary tract itself has long been sought. In its absence

it is not irrational to suspect that this dysfunction results from emotional stimuli sent down to the biliary tree from the higher centers. It is just as reasonable to suppose that emotion can affect that structure as that it can affect sphincter and smooth muscle elsewhere in the abdomen. What the lay person interprets as biliousness may be nothing more than this emotional disturbance of the bile tract, causing associated duodenal stasis, regurgitation of bile in the stomach, bitter taste in the mouth and fullness and distention of the abdomen. Not too infrequently no organic evidence of disease can be demonstrated after exhaustive studies.

This may explain the persistence of symptoms following cholecystectomy in a patient with a noncalculous gallbladder or one not much pathologically changed. The persistence of symptoms in a patient on an adequate medical therapeutic régime without operation may yield to the same explanation. Every clinician is familiar with the relief such patients feel on sedation; yet this temporary relief affords no comfort to those of us who aim at the eradication of the etiologic factors. Even today, with all our laboratory and physiologic data, have we advanced very much in our knowledge of the intimate nature of this mutual influence of bile and psyche? The old classification of melancholia and choleric temperament by Hippocrates indicates a prescientific tacit acknowledgment of the relation of emotions and cholecystic disease. If this hypothetical approach is tenable, we must look to the psychiatrist to classify the emotional stimuli which produce the dysfunction. Only through this combined approach can we hope to make any lasting impression on these symptoms, with restoration of the patients to near normal.

I have left the problem of peptic ulcer until the last, because I know that you are most familiar with this syndrome.

That psychodynamic factors play a role in the life cycle of many ulcer patients has been well substantiated in recent years. Today it is known that no permanent cure of a peptic ulcer patient can be brought about where the unconscious emotional factors have significance in the clinical picture, unless those emotional factors are carefully evaluated, scientifically handled, brought to the surface and properly eradicated. The recurrence of peptic ulcer can usually be laid at the doorstep of the physician who fails to take these factors at face value. Symptomatic relief from any medical or surgical procedure is not enough. However, psychoanalysis, be it brief or prolonged, must always be combined with adequate medical control. Only through the pooling of all our efforts, somatic and psychologic, may we hope to bring about a permanent cure of these conditions.

It is important in this connection not to make unwarranted generalizations. For example, gastric ulcer frequently presents an entirely different therapeutic problem. Carcinomatous ulcer, or even the remote malignant transformation of a benign to a malignant ulcer, is all too frequent to warrant fiddling while Rome burns. No competent internist, surgeon, pathologist, roentgenologist, and, I might even add, gastroscopist can differentiate between a benign and a malignant ulcer by gross inspection in questionable cases. The final diagnosis must rest on the microscopic evidence.

Therefore, I plead for a great deal of care and circumspection in the conservative care of a chronic gastric ulcer. Until reliable differentiation between benign and malignant gastric ulcer can be made, the surgical approach is preferable to any conservative treatment, medical or psychotherapeutic. The simple, early, uncomplicated gastric ulcers which occur frequently in young persons do not necessarily fall into this category. In such cases there is place for the psychotherapeutic approach, under constant medical vigilance.

Duodenal ulcer, in its life cycle, its healing and its course, may be viewed more optimistically. But here again, when the duodenal ulcer penetrates beneath the mucosa, when it becomes indolent and refractory to medical management, the psychotherapeutic approach is not the answer to our prayer. It should not be considered a panacea. Many patients may have to be first treated surgically and only then handled psychotherapeutically to prevent a recurrence or the occurrence of new ulcers. The careful, honest evaluation of each case on its merits offers the best possible hope of permanency in the cure. One cannot warn too emphatically against making the psychotherapeutic approach a new panacea for all patients.

It is impossible in the time allotted to review the whole subject of the upper abdomen. I have had to restrict myself to those common clinical pictures in which psychodynamic factors may and do play an important role. My main emphasis is on a need for healthy cooperation—for pooling of somatic and psychologic knowledge. Then and only then will the patient get a real service from the medical profession.

PANEL DISCUSSION

DR. FRANZ ALEXANDER: Dr. Sheehan's physiological approach to the problem of emotional influences upon vegetative dysfunctions is in many respects similar to that which we have applied for years in our psychosomatic research at the Chicago Institute for Psychoanalysis. Emotional states are a part of the total reactions of the organism to environmental situations. The internal vegetative processes of the organism have to be adapted to the external tasks with which the organism is confronted. This adaptation of the internal vegetative functions takes place partially through hormonal mechanisms and partially through autonomic innervations. Dr. Sheehan has presented in his paper the internal adaptations of the organism to emergency situations. These adaptations take place according to the principles worked out by Cannon and his school. They consist primarily of a preponderance of sympathetic over parasympathetic tonus. Dr. Sheehan mentioned, however, that in such emotional states an increased parasympathetic tonus can also be observed. This represents a paradoxical non-utilitarian reaction since the functions under the control of the parasympathetic nervous system are those of digestion, storing—the anabolic processes of the organism. If the organism's reaction were fully utilitarian, these peaceful functions of upbuilding and storing would step into the background whenever the organism has to fight or face an emergency situation and therefore must mobilize its reserves. In emergency situations in the organism, changes take place similar to those mobilized within a nation in time of war. Certain industries have priorities. Every product which is connected directly with the war receives preference. Similarly in emergency situations in the organism the digestive functions and the storing functions must be suspended for a while or reduced to a minimum, whereas the mobilization of quickly combustible fuel becomes imperative together with a change in the distribution of blood supply to those organs needed in the emergency situation. Gastric hyperfunction or that of the guts are therefore paradoxical and non-utilitarian; in a sense they sabotage the effort which the emergency demands.

Psychoanalytic studies of a great many cases throw an interesting light upon these paradoxical reactions to emotional stress and strain within the organism. Among these reactions are hypersecretion of the stomach, diarrhea and emotional hypoglycemia, lately described by Sidney Portis. The common feature of all these conditions is a retreat from effort, strain, danger, to an attitude characteristic for relaxation. The digestive, the anabolic, storing functions are stimulated. In stomach neuroses and peptic ulcers, although there is no food intake, the stomach behaves exactly as it does just before eating. In hypoglycemia, although it is needed, sugar quickly disappears from the blood circulation under parasympathetic stimulation of the Islands of Langerhans. It is as if the organism shunned the realistic tasks it has to face and retreated into an attitude, inappropriate to the task and permissible only in a state of relaxation. An attitude of wish-fulfillment overcomes the reality need. Although relaxation is certainly not indicated, the organism behaves as if it could relax. This is obviously a psychological escape phenomenon, which I should like to denote as "vegetative retreat." Examples of this retreat are to be found in the psychological picture in peptic ulcer, in chronic diarrhea and, most simply and clearly, in psychogenic hypoglycemia which produces attacks of fatigue. In all these vegetative neuroses, the organism retreats from an effort which should be directed toward the environment and the task it is called upon to accomplish.

In the peptic ulcer cases, the receptive oral tendencies are mobilized as a retreat from effort and activity. A patient I once observed would develop acute ulcer pains whenever he watched a violent fighting scene in the movies. Identifying himself with the fighter he ran for shelter to his mother—not to her skirts but to her breast. The diarrhea patient also substitutes intestinal activity for mental or muscular effort. More complete is the retreat in patients with psychogenic fatigue, who react with a feeling of exhaustion to work—particularly routine work—which they perform only under external or internal pressure (sense of duty) but without intense interest or enthusiasm. In many cases, however, the exhaustion has a definite physiological basis—hyperinsulinism followed by hypoglycemia. Just as in peptic ulcer cases or in emotional diarrheas this reaction is a result of vagal excitation, or more precisely a disturbance in the sympathetic-parasympathetic balance. The

question as to why one branch of the pneumogastric nerve is involved in one case and a different branch in another is still open. The emotional configuration seems, however, to play an important role in the choice of the vegetative function to be disturbed by the defeatist emotional attitude which leads to various manifestations of vegetative retreat.

DR. BEAUMONT S. CORNELL: From Dr. Portis' article it would seem that psychological examination may prove of importance whether the patient has an organic or so-called "functional," ailment. Judging from the current attitude of the profession toward the etiology of ulcer, it is probable that the psychic aspects of other organic diseases will receive increasing attention from now on.

It is a relatively simple matter to detect anxieties or fears in many patients and to be sure that these do play a conspicuous role in the production of symptoms, or even, at times, in the production of an actual tissue change.

If we should attempt to correlate such a lesion as hypertrophic gastritis etiologically with psychological complexes in their Freudian sense, we must surely be careful and proceed slowly. Major psychic analysis is a time-consuming technique. Many of us who subscribe to the general thesis that the emotions have a demonstrable effect in producing not only symptoms but even lesions are not necessarily persuaded as to the universal importance of the Freudian conceptions. But Dr. Portis' well-tempered suggestions will direct our observations increasingly to the emotional life in persons suffering especially from biliary disease.

DR. GEORGE E. DANIELS: The papers of Dr. Sheehan, Dr. Portis, and Dr. Weiss make a particularly happy combination for this symposium because of the varied but overlapping points of view expressed. Dr. Sheehan has portrayed beautifully the intricately regulated and carefully poised nervous and humoral mechanism constantly operating in attaining what Cannon has termed "homeostasis." He has rightly emphasized that any experimental or clinical variations in the pattern have to be evaluated against the background of unstable equilibrium. Dr. Sheehan's conclusion that functional disturbance, although different, may be as *physical* as so-called organic physical disease, is well illustrated in his examples of carotid sinus syncope, Raynaud's syndrome, and Hirschprung's disease. Even of greater importance, and in line with present investigative findings, is his belief that functional disturbances if sustained may lead to organic change.

Dr. Portis has made a real contribution by attempting to elucidate some of the actual physiological mechanisms involved in so-called functional gastrointestinal disease as well as in organic disease associated with a large emotional component. Both the general physician and the psychiatrist are apt to lose sight of the actual physical discomfort that many of their patients suffer because they fail to realize that although the source of the pain is emotional, the disturbed physiology resulting can give rise to physical pain as real as from any other quarter. In this regard Dr. Portis' description of the mechanisms involved in duodenitis in which overdistention of the stomach frequently exerts mechanical pressure on the retroperitoneal portion of the duodenum, is a case in point. Gastritis is a condition that neither the gastroenterologist nor the psychiatrist have been able yet to elucidate satisfactorily. Dr. Portis' suggestion that this in many cases may be due to hyperfunction as explained on an emotional basis, is definitely helpful in approaching the problem. His observations on psycho-physical mechanisms in connection with gall bladder disease begin to throw some definite light on the physiological components of dyspepsia which is another enigma and often does not yield to psychotherapy.

It is with such conditions as hypochondriasis in its classical form that I believe the approach made possible by the combination of the physiologist, internist, and psychiatrist will be necessary before we make any further progress. Dr. Sheehan mentioned causalgia and in a recent communication showed very beautifully the ways in which irritation stemming from some irritated nerve endings may reach explosive and all-consuming importance for the personality. In these condition, unless the physiological irritation can be eliminated or reduced, there is little chance of the psychological approach making headway. With the hypochondriacal patient complaining interminably about his gastrointestinal tract, unless the vicious circle leading to physiological, although functional, changes that give rise to the pain and discomfort can be broken, there is little chance or opportunity to deal with the difficult, rigid, narcicisstic personality involved.

Dr. Portis mentioned the importance of food in early life as a symbol of love and security, and touched on Alexander's hypothesis that a gastric

disturbance, such as peptic ulcer, often represents the repressed longing for dependence, translated into an early physiological mechanism associated with maternal love and security. Alexander and other authors have also brought out the aggressive qualities present in the unconscious of many of these patients. Mittlemann and Wolff have made the very interesting suggestion that the overactivity of some of these stomachs is in response to the earlier primitive preparation of the stomach to receive the prey which is about to be attacked. We have not yet come to a fully unified concept explaining both psychologically and physiologically what takes place in such patients. Both the foregoing hypotheses are of great interest and both, it would seem, are facets of this complicated problem.

I will not go into any detail in the discussion of Dr. Weiss' most interesting paper on cardiospasm. This represents the last communication of the well-balanced program in which an internist with experienced psychoanalytic insight has applied the combined approach to the study of a condition generally treated by mechanical means. His conclusion that cardiospasm is a psychosomatic disorder is important in view of the varied hypotheses generally invoked to explain the phenomenon. Dr. Weiss had no opportunity to completely psychoanalyze any of these patients, and to my knowledge no such report is in the literature. Such more exhaustive and penetrative studies, when made, one would feel confident, would bear out Dr. Weiss' conclusion drawn from the carefully, but more casual psychological studies reported in this group of cases.

DR. MCCULLOCH: I would like to comment on two things: first, concerning disturbances traveling in circular paths—from the nervous system into the periphery and back to the nervous system. I should like to point out that if these were of such a kind as to reduce the response in question—i.e.—negative feedback, then the mechanism is essentially homeostatic; whereas, if they were the reverse—i.e.—regenerative, then they were apt to produce what we commonly think of as a vicious cycle. I would point out in this connection that it is possible today to deduce purposive behavior—appetitive and attentive,—as well as homeostatic, from mechanisms of this type; as witnessed by Rosenblueth and Weiner in the Journal on the Philosophy of Science, and as was already familiar to them in name, at least, in the behavior of the modern torpedo or the self-tuning radio.

My second comment is in connection with Doctor Alexander's remarks: I would point out that the reactions of our bodies are often linked in temporal sequence, so that, following excitement and consequent out-pouring over the sympathetic to the adrenal, with a rise in blood sugar, there normally follows an activation of the insulin system, presumably by way of the parasympathetic nervous system, whose business it is to bring the system back to normal. That such a system should undershoot or overshoot is not surprising; so that the term "vegetative retreat" points merely to one aspect of a well-known physiological pattern, and the consequent hypoglycemia presumably represents either a temporal dislocation of the mechanism, or, at most, an exaggeration of the normal consequent phase. I think we can compare the phase relationships of the autonomic responses to the check mechanism, i.e., to relations of tension in agonist and antagonist, mediated by the cerebellum. Undoubtedly the entire system is purposeful, but it seems to me somewhat unwise to assign specific external purposiveness to what might well be only exaggerated phases of an integral homeostatic process.

GENERAL DISCUSSION

DR. SANDOR LORAND: After the elaborate and excellent discussion, anything I could say would be merely repetitious. However, I have one or two questions. The first question relates to the paper of Dr. Weiss, which I thoroughly enjoyed. I might add that my clinical experience corroborates fully Dr. Weiss's conclusions.

My first question is, was there some technical difficulty accounting for the fact that Dr. Weiss's patient, a girl of 25 years, who was sick from the age of 15, was not treated with more intensive psychotherapy?

The second question is: "What happens to these cases in psychotherapy?" Of course I understand that many are not amenable to treatment for the simple reason that they are either hypochondriacal or suicidal. To what degree can they be treated? How to approach them in treatment and how far to go, are problems which makes the treatment of those cases very involved, because it must be a combination of all kinds of therapeutic methods. They are, in a sense, children. The analyst has to go where the patient leads him, for the most part, and must not lay down rules. Neither can he be active or aggressive.

In gastro-intestinal problems, in addition to the depressive feature, the patient has neurotic problems concerning food. I made the point in "Anorexia" that difficulty in eating was not only a problem for the patient but that food created problems for the whole family. In my patient's case, food was a constant topic of discussion in the family; good or bad food, cooking, eating, more and less food. The father and the grandfather were retired restaurateurs.

It was said, I think, by Kaufman, that patients of the type presented here are likely to develop spastic colitis. All of them really love and hate with their guts. They are full of hate, very aggressive, and the aggression has to be mobilized and brought out in order for the therapy to be effective.

DR. OBERNDORF: I wish I could use the language of physiology with the scientific accuracy of the previous discussants but I speak merely as a physician, a kind of technician who spent twenty-five years with practically every type of case in neurological and general medical hospital wards. We certainly find some psychological conditions in all patients' environment that may be responsible for a patient's illness. The history of a patient came to my mind as particularly relevant. A lady was referred for headaches to the neurological ward. Because she showed no objective signs, as a psychiatrist I was asked to investigate the psychological situation. The patient was a middle-aged woman of forty-five with a history which began with an unwanted marriage and a fall down the stairs on the day of her marriage resulting in bleeding from the vagina. Nevertheless her husband insisted upon coitus. From her marriage day she attempted to solve severe recurrent problems—enough to give anybody a headache. I must say that I felt her headaches were purely psychological. Fortunately for me, I did not put any opinion on paper. Some two months later I met her in the dispensary. "How are things going?" I asked her. She said, "Oh, Doctor, not very well. I still have headaches and I see double." I replied, "You must go back to the hospital immediately," which she did, and there her headaches continued for about two weeks when she died. We found a huge glioma on the frontal lobe. To be sure shortly before death she had developed an optic neuritis.

I should like to refer to a similar case where the patient was an overt homosexual with projectile vomiting. The cause of his difficulty was ascribed to low blood pressure. Because of his numerous complaints he was assigned to me for a psychological approach. I had wonderful success with him—for a while got him out of bed and induced him to eat many foods which he had previously rejected. One morning I went to his bedside to be told that he had died suddenly during the night. The psychological background could easily have explained his symptoms but at the autopsy we found caseous degeneration of both adrenals which killed him and also accounted for his symptoms. Possibly his earlier psychic tensions did cause his adrenal degeneration but that is doubtful.

Another aspect of the psychic treatment of psychosomatic conditions should be brought out before this audience as medical men; that is that the hospital atmosphere is usually very unfavorable to the psychological approach. No matter what we may do, positive transference is extremely difficult to maintain. The patient is attuned to

other forms of treatment and subject to suggestions over which the psychiatrist has no control. For these reasons it seems to me that when a psychological diagnosis is established in the medical ward, the patient should be transferred as soon as possible to the out-patient department.

There is still another difficulty. One psychiatrist begins work in the ward, makes a diagnosis and may be successfully influencing the patient. Then the patient goes out and the effort which the original psychiatrist has spent on this patient is lost. Nothing is done thereafter. It often reminds me of a surgeon who cleans the skin for an operation, gets good and ready, may even make a superficial incision and then no operation is performed. Many of these sensitive neurotic people have a very delicate psychiatric skin and suffer harm for having this sort of psychiatric incision performed upon them and then having nothing further done.

Dr. French: Dr. McCulloch's discussion interested me very much because I should like to raise the same question from the psychological point of view as he raised from the physiological point of view. For a long time I have been inclined to question the adequacy of formulations in terms of mere preponderance of one kind of dynamic tendency over another. To classify a patient merely as very receptive or very dependent gives a really inadequate picture of his personality. In order to get a more adequate picture it is necessary to discover under what circumstances he is dependent and what forms his dependence takes. Personality is so complex that it is quite impossible to account for the innumerable variations in personality pattern in terms of two or three dynamic tendencies and their quantitative variations. As Dr. McCulloch pointed out in the physiological field, so also in the psychological field, life is best understood in terms of patterns in which different dynamic tendencies are seen in more or less complex relationships to one another.

Freud's original orientation was to attempt to understand personality in terms of previous memories, and psychoanalysis, for a long time, was dominated by Freud's interest in tracing back the specific patterns of a patient's behavior and symptoms to actual experiences in the patient's life history. Innumerable possibilities of variation in pattern in different life histories seem to provide an adequate basis to account for equally great possibilities of variation in behavior patterns. In recent years there has been a considerable reaction against attempting to account for a patient's symptoms in terms of detailed reconstruction of the life history. It is true that this type of formulation was occasionally carried to a ridiculous extreme, as, for example, when an attempt was made to explain some very fundamental physiological reaction as based upon one specific incident in the patient's life. My feeling is, however, that this reaction against interpretation in terms of the life history has gone entirely too far and that in now attempting to interpret behavior in terms of quantitative variations of two or three fundamental biological tendencies we are in danger of losing our sense of the importance of total patterns in the determination of behavior. What is specific about a memory? If we compare the memories of different people we find that the same elementary tendencies run through them all but what differentiates one patient from another is the pattern in which these same elementary building stones are combined. Everyone has oral cravings and aggressive impulses, et cetera but the life histories of different people have combined them in many different kinds of combinations.

If you will pardon me I shall leave the gastrointestinal field for a moment and draw an example from a detail of our asthma research which, it seems to me, has a bearing upon this problem. The most dramatic accounts in the literature of psychogenically precipitated asthma attacks are incidents in which a situation such as would be expected to produce a violent emotion was reacted to instead with an attack of asthma. In contrast to these stories one found also in the literature reports of patients whose asthma attacks were suddenly interrupted by a situation which called forth violent emotion or made necessary energetic activity. It appeared that these patients were cured of their asthma attacks by the very same kind of acute situation that precipitated asthma attacks in others. Now it seems very easy to account physiologically for a cure of an attack of asthma by intense emotion. We know that intense emotions cause the secretion of adrenalin and that adrenalin is capable of giving marked relief in an asthmatic attack. It would seem therefore that intense emotion might easily be the equivalent of giving the patient a dose of adrenalin which would then relieve his asthma. But how then could we account for the fact that in other patients the same kind of intense emotion actually precipitated an attack of asthma? The explanation for this fact

is probably to be found in another characteristic of these episodes, which I purposely did not mention until now. This is the fact that patients who developed asthma attacks in reaction to violent emotion were reacting not just to violent emotion but to violent emotion which for one reason or another the patient was unable to express. The asthma attack was a reaction to an acute emotion that had been suppressed.

The fact that asthma attacks are relieved by adrenalin has suggested the theory that asthma attacks are based upon predominant parasympathetic stimulation. This theory would account fairly well for the relief of asthmatic attacks by intense emotion. But how are we to account for the precipitation of asthma attacks by violent attacks of emotion? The clue to the answer to this question would seem to be the fact that it is the suppression of violent emotion that seems to precipitate the asthmatic attack. If we translate this into physiological terms it would seem that the situation that precipitates the asthmatic attack is one in which an acute stimulation of the sympathetic system is suddenly energetically inhibited. Thus these facts suggest the hypothesis that the situation that precipitates the asthma attack is not either sympathetic stimulation or parasympathetic stimulation alone but a pattern in time in which an initial sympathetic stimulation is suddenly inhibited and perhaps succeeded by a parasympathetic stimulation or, at any rate, by some kind of incoordination between sympathetic and parasympathetic activation. Another detail of our asthma research seems to confirm this conclusion. Asthma attacks seem to occur in situations in which a person wishes to cry but does not do so. We came to the conclusion therefore that asthma is some kind of an equivalent of an inhibited cry. The patient wishes to cry out loud and hard but suppresses the cry and has an attack as asthma. Some of our patients even boasted that they never cried; they had asthma attacks instead. Again we have the suggestion of a sudden inhibition of an urge to energetic use of the respiratory system for the purpose of expressing emotion, which, in physiological terms, might well lead to a struggle between tendencies to intense stimulation of both sympathetic and parasympathetic systems and a resultant incoordination.

Thus if our formulation of the physiological basis of psychogenic asthma attacks is correct we have the explanation, not in terms of the predominance of either sympathetic or parasympathetic systems, nor of any well integrated balance between them, but in a pattern of incoordination resulting from a too intense stimulation of both systems at the same time.

I suspect that most psychosomatic manifestations will find their explanation in more or less well coordinated patterns of innervation involving not one but two or more physiological systems and that many of these patterns will involve even greater complexities than the one I have just discussed.

Dr. Portis: There have been many phases discussed this afternoon. I think, from my standpoint, it is very important that the internist have a clear conception of the pathologic physiology that results from psychodynamic factors in psychogenic disturbance, as far as the abdominal viscera are concerned. However, on the other hand it is equally important to those of us who are entering this field to keep constantly uppermost in our minds the outstanding clinical observation that serious organic disease may be entirely masked by symptoms which appear to be purely psychologic in origin. Each part of the clinical picture must be given its due importance, and judgment must be passed, in the last analysis, on a very careful perusal of all the factors at hand. It must also be borne in mind that abdominal organic disease may aggravate the emotional disturbance in a given patient, and its importance in this relation must be carefully evaluated.

However, since the introduction of psychosomatic medicine, we are now able to understand many complex problems of the gastrointestinal tract which heretofore had no real scientific explanation. The problem of peptic ulcer with its familial aspect becomes more understandable, as do those of gallbladder disease and disturbances of function of the small and large bowel. There should be increasing clinical evidence that gallstones of the non-infective type are probably the result of a psychogenic disturbance of the biliary apparatus.

Dr. Cornell raised the question this afternoon of angina pectoris. I do not know whether the patient with a functional disturbance in one part of the gastrointestinal tract can have referred pain in another portion of the viscera, but I do know that a patient with organic disturbances may have pain referred elsewhere. The classical example is that of the patient with duodenal ulcer having a precordial distress.

Following up what Dr. Obendorf has said, I think it deserves a great deal of thought because we cannot allow a young student or interne in a hospital to dismiss a patient as suffering from psychosomatic disease unless that student or interne has careful supervision by those who are familiar with these clinical pictures. Also, again, we must impress on those whom we teach that psychologic, psychogenic and organic disturbances may coexist in the same patient.

If we approach this new field of medicine with a sincerity of thought and a solid foundation, there should be, as our experience grows, fewer and fewer errors made in our conclusions.

DR. WEISS: My practice is restricted to internal medicine and the opportunities are limited for referring such patients to analysis in my locality. Even if I had the opportunity of sending such a patient to analysis, I would advise the analyst that during periods of resistance the patient might be unable to swallow. I can imagine that this might be a dangerous situation.

The second point concerns the question raised by Dr. Obendorf and Dr. Portis. Psychosomatic medicine does not mean to study the "soma" less; it only means to study the "psyche" more. Of course, as long as we are human, we are going to make mistakes, but we won't make as many mistakes if we pay as much attention to psychopathology as we do to tissue pathology. Just that attitude—cautioning against "missing something organic" and at the same time failing to give medical students a good background in psychopathology—has been responsible for holding back the development of medicine, because the general practitioner is scared to death that if he concerns himself about psychological matters, he is going to miss organic disease. When that policy is pursued to its ultimate conclusion, it means that some organically-minded physicians never stop making physical investigations, because they can always think of another kind of physical problem—infectious, allergic, metabolic or endocrine—that might be responsible for the illness. The result is needless medical investigation and unnecessary medical and surgical treatment for a great many patients who have illnesses of emotional origin. After a long experience in teaching I am convinced that we cannot hope for more progress until we stop telling medical students that they must think of the psychogenic factor last and only after all physical disease has been excluded. Psychogenesis deserves the same consideration as germs. Diagnosis is not simply a question of exclusion of physical disease—it is exclusion plus a simultaneous study for psychogenic factors.

DR. ALEXANDER: I would like to say a few words about Doctor McCullouch's man who hears a pistol shot behind his back. In such a situation certain people run, others may become paralyzed, some may develop vegetative disturbances such as diarrhea or stomach upset, while their voluntary muscles remain inactive; and finally there are persons who may grab in their pocket and pull out their own revolver in the good old tradition of the wild west. For the psychiatrist just these individual differences are of importance. What I call "vegetative retreat" is a neurotic reaction. Although to some slight degree this reaction might be present in anyone in a startling situation, the normal individual will prepare to fight and behave in a utilitarian way, which is aimed at facing the emergency. The neurotic individual will react to the emergency not with the correct innervations of his voluntary muscles and increased sympathetic tonus, but with visceral reactions under the influence of increased vagotonus. This is what I call "vegetative retreat," which can be considered a neurotic substitute for full fledged voluntary behavior. Whether it is based primarily on increased vagotonus or decreased sympathetic tonus is an open question; what is certain, in these cases, is only that the sympathetic-parasympathetic balance is disturbed in the direction of a vagal preponderance.

I think the analogy of peace time economy when war time economy is needed helps to illustrate this concept of vegetative retreat. In an emergency situation war time economy is needed. In the organism this consists in a preponderance of sympathetic over parasympathetic tonus resulting in mobilization of sugar—increased blood supply of the organs needed in combat, etc. The condition of vegetative retreat is characterized by parasympathetic preponderance and represents just the opposite type of reaction; the functions of digestion and storing are stimulated, in other words it is peace time economy in war. The cause is an emotional one: defeatism, a retreat from danger and effort.

In some respects a formulation of Freud about psychoneuroses can be well applied to the vegetative neuroses. According to Freud a neurosis consists in substituting an autoplastic symbolic process

(symptom) for a full fledged, well coordinated, voluntary act. In the vegetative neuroses, not a symbolic process (phantasy) but an internal visceral function, takes the place of a voluntary outward directed act. Instead of attacking his adversary, the neurotic develops a headache, hyperacidity of the stomach or increased peristalsis.

Finally I wish to make it clear that I do not try to revive Eppinger's and Falta's attempt to divide humanity into vagotonics and sympathicotonics. However, certain conditions can be well characterized by disturbed sympathetic-parasympathetic balance consisting in a preponderance of either side. Peptic ulcer or hypoglycemia are examples for vagal preponderance, arterial hypertension for sympathetic preponderance. At different times both of these conditions may occur in one and the same individual, or as Dr. McCullouch postulates it, a rapid oscillation between the two types of tonus may occur. In many chronic conditions, however, I believe we must assume a preponderance of the one or the other type of tonus: sympathetic or parasympathetic. I propose the expression "vegetative retreat" for a chronic parasympathetic hyperactivity occurring in situations in which an increased sympathetic activity is the normal reaction. In arterial hypertension, although there is a neurotic condition, there is no "vegetative retreat"; the vegetative innervations are adequate in direction, sympathetic excitation being adequate in emergency situations. What is morbid in these cases is that the increased sympathetic tonus is sustained over a long time; the patient is in constant preparation to fight but never really fights. It is a chronic vegetative preparation to an outwardly directed act which is never consummated. It is an incomplete act. In every behavior we can differentiate between internal vegetative adaptation of the organism to the outward activity and the voluntary activity itself. In hypertension only the internal vegetative adaptation takes place; it, therefore, is a neurotic condition. In cases of vegetative retreat the neurotic disturbance goes even further. The vegetative adaptation is paradoxical; peace time economy in war.

Dr. Daniels: I should like to comment briefly on the question Dr. Obendorf has raised relative to the treatment of the hospital patient by the psychiatrist. At the Presbyterian Hospital we have gradually trained the staff to refer these patients when they first enter the hospital to the psychiatrist, rather than to leave the psychiatric diagnosis until the end of the patient's stay and thus leave him stranded. By referring the case early, the psychiatrist is able to follow the case through various examinations and, at the same time give him psychotherapy. He is then in a position to follow up the case later.

Dr. McCulloch: I feel very strongly that most of us are already hopelessly brought up in one school or another school, and that it will not take us but a generation to come after us to be brought up with an experience more like Dr. Obendorf's where the two aspects of medicine, the psychological and the physiological are forever united.

I want to say one thing about timing. I grew up in the mountains of New Jersey and there were "powder monkeys" in the mines. Particularly in winter the powder monkeys suffered a great deal from headaches. The headaches were less frequent after the first year or two of being a powder monkey. These headaches were very funny; they were Monday morning headaches. Many of them would drop in complaining of pain on Monday morning. Today this is a well known phenomenon and has been studied more thoroughly recently in powder factories. The organism gradually adapts itself to the quantity of nitrate which is inhaled. When Monday morning comes around, the blood pressure may suddenly fall (i.e. the system may suddenly over-react in the opposite direction) and the man die in a generalized collapse. The headaches used to be regarded as "these Monday morning headaches," i.e. as functional affairs for there was no pathology visible in any of these men. Today, to regard the entire picture as a functional affair may be right, but the implication was, at that time, that it was a psychological affair pure and simple. That was obviously wrong.

My feeling is that again—and my chief interest is with the central nervous system in the psychological picture—we ought to be doubly careful to diagnose and determine the various neuroses by positive as well as negative findings before dealing with them as psychogenic.

AN EVALUATION OF PSYCHOBIOLOGIC FACTORS IN THE RE-EDUCATION PHASE OF THE KENNY TREATMENT FOR INFANTILE PARALYSIS*

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Miss Elizabeth Kenny and her associates at the University of Minnesota have called attention to the fact that there are four major signs and symptoms to be dealt with in infantile paralysis. These are actual paralysis, painful muscle spasm, "mental alienation" and "muscular incoordination." The first symptom, paralysis, is due to irreversible structural changes in the anterior horn cells of the spinal cord. As yet, no specific therapy for this lesion has been devised. The second, painful muscle spasm, is essentially a disturbance in muscle physiology. In the Kenny method it is treated by the application of hot fomentations to the skin areas overlying the spastic muscles. This is the first phase of the Kenny treatment and is not the concern of this paper. The remaining symptoms, "mental alienation" and "muscular incoordination," described by the Minneapolis group (1), have been the subject of much interest and discussion. The second phase of the treatment, "re-education," is directed to these symptoms. It is the purpose of this communication to consider whether or not these two symptoms are essentially psychobiologic reactions to an organic disability rather than due directly to the disease process, and, if so, to see wherein re-education, as employed by Miss Kenny, represents a combination of the principles of psychotherapy and physical therapy. That these symptoms are treated effectively by "re-education" is in itself an indication that they are to a large extent psychobiologic in nature.

Before taking up the psychobiologic factors in the Kenny concept and treatment of infantile paralysis, it would be well to consider first some psychobiologic factors in the muscular activity of physically healthy individuals. Muscular activity as observed in different individuals has a wide range of usage and variation which cannot be differentiated solely on the basis of variations in neuromuscular systems. Since the aggregate of man's personality functions represents the highest level of organismic integration, individual patterns of muscular activity may be differentiated not only as functions of the neuromuscular system but also as functions of the personality. Clinical and cultural experience does, in fact, teach that certain patterns of muscular activity are expressions of underlying personality traits and strivings, and, therefore, determined to a large extent by them. Examples of such patterns are seen in the circumscribed muscular immobilities and activities of the hysterical reactions; the muscular rigidity, posturing and expressionless grimacing of the catatonic reactions; and the drawn, tense facial muscles in anxiety and depressive reactions. All of these specific variations in muscular activity have meanings in terms of underlying personality functions and are psychopathologic in nature. In the normally functioning personality there is an equally wide range of variation. There are, for example, the graceful and expressive muscular activity of the ballet dancer and the precisely coordinated muscular movements of the highly trained athlete. These muscular abilities stand in contrast to the relatively awkward utilization of the muscular system in other individuals whose underlying personality strivings are in other directions and who stress other values. Finally, there are the more subtle and extremely significant variations in mannerisms, posture, gesture and facial expression which do much in expressing the inner self to the outer world and which help distinguish one individual's personality from that of another. Verbal language, the most common means of communication with our fellow man, would be greatly limited were it not enlivened and punctuated by the supplemental language of posture, gesture and changes in facial expression. Furthermore, it is known from anthropologic studies that in primitive cultures the reverse is true; gesture and facial expression constitute the essentials of communication while verbal productions are supplemental (2).

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The symptoms "mental alienation" and "muscular incoordination" have not been explained satisfactorily on either anatomic or physiologic grounds. The question arises, then, whether or not they can be explained on psychobiologic grounds along the lines indicated above. Miss Kenny herself appears to look upon these symptoms as psychologic, or, more appropriately, psychobiologic in nature. In presenting her concept of "mental alienation" she speaks of changes in the "subconscious mind" as being involved in the "loss of mental awareness" of a given muscle or group of muscles. In her first book she writes, "When a limb has been immobilized, the patient experiences a feeling of mental detachment in regard to it and loses the consciousness of possession" (6).[1] This observation points to a disturbance in sensory function. The Minneapolis group with which Miss Kenny is associated emphasize the motor aspect of the phenomenon when they define "mental alienation" as the "inability to produce a voluntary purposeful movement in a muscle in spite of the fact that the nerve paths to that muscle are intact. This is a physiologic block which must be distinguished from the organic interruption resulting from the destruction of anterior horn cells by the disease" (1). It is clear, from an analysis of these two statements, that there are two aspects to be considered in "mental alienation" and that this phenomenon is in reality made up of not one but two distinct though related symptoms. Although the Minneapolis group has not drawn a clear line of distinction between these two symptoms, they will be dealt with here as two separate symptoms which can be differentiated psychobiologically. The one symptom is sensory in nature and is identified by Miss Kenny as "loss of mental awareness." A disturbance of the proprioceptive functions of the "consciousness" is implicit in Miss Kenny's statement concerning "loss of mental awareness" quoted above. The other symptom is motor in nature and is defined by Miss Kenny's associates as "mental alienation." The definition of "mental alienation" given by these authors suggests either a neurophysiologic disturbance along the course of the motor pathways or a disturbance in the ability of the personality to initiate the physiologic process which constitutes the passage of a nervous impulse along motor pathways. The following observations point to the latter explanation as the more likely.

The fact that orthopedists and physical therapists (1, 4, 5) have observed a similar phenomenon in conditions other than infantile paralysis is evidence that these symptoms are not features of the disease process itself. The occurrence of these symptoms in practically all cases of infantile paralysis suggests that they represent a normal reaction to muscular immobilization incident to the disease. The fact that "loss of mental awareness" and "mental alienation" may be successfully treated by re-education within anywhere from a few days to several weeks, immediately or remotely following the acute process, or, if not treated at all, may persist indefinitely, regardless of the relative severity of the disease process, is evidence that these symptoms do not vary with structural or physiologic changes but with some other factor. The fact that these symptoms respond to re-education, which is chiefly a psychotherapeutic measure, is evidence that the disturbance is due not so much to a neurophysiologic disturbance but to a failure of the proprioceptive and motor functions of the personality. Thus, it may be that the patients who are resistant to treatment and who cling persistently to these symptoms do so entirely on psychobiologic or psychopathologic grounds, and that these cases may be differentiated on the basis of variations in personality organization and functioning.

Psychiatrists, without being able to give a purely physiologic or mechanistic explanation for the phenomenon, have applied the concept of "dissociation" to any condition in which a given function, sensory or motor, becomes separated from the total mass of personality or organismic functions on a purely psychobiologic basis. Present knowledge of "loss of mental awareness"[2] and "mental alienation" does not exclude either of these symptoms from this definition. An example of such dissociation of sensory and motor function occurring

[1] In this connection it is interesting to contrast this reaction to the partial loss of function which occurs in infantile paralysis with the so-called phantom experience of some individuals who have undergone an amputation of a limb and still retain a consciousness of possession in spite of the total loss of both structure and function. The psychobiologic implications of these contrasting symptoms and their significance in terms of variations in the body image, both postural and dynamic, offer very interesting problems for further investigation and will require intensive study.

[2] According to B. Hart, any condition of "unawareness" occurring psychobiologically is a form of dissociation (3).

normally and without physical handicap is the musician who, through want of practice, has "forgotten" how to play a piece of music that had been mastered previously. In re-establishing this function, which has been dissociated, by means of re-education it is necessary to restore intricate proprioceptive functions to the personality (not the neuromuscular system alone); and also to re-establish within the personality complex patterns of emotionally charged motor functions which will initiate impulses that eventuate in correspondingly complex contractions of individual muscles, parts of muscles and groups of muscles. This whole series of events is summed up in the popular expression, "a highly developed sense of touch." To the neurologist the "sense of touch" refers to tactile sensation, whereas what is really referred to in this expression is that fine adjustment between the proprioceptive and the motor functions of the personality which characterizes persons who are talented along these lines. The questions arise, then, (1) whether or not "mental alienation" is a psychomotor dissociative mechanism resulting from the inability of the personality to organize and initiate a given pattern of motor impulses; and (2) if "loss of mental awareness" is a psychosensory (proprioceptive) dissociation which conditions the individual for "mental alienation" by virtue of a withdrawal of proprioceptive influences from the personality. If an individual is not receiving sensory impulses from a part of the body, he has no spontaneous desire to move it. The answers to these questions can be had only by a study of the personality functions of a group of patients with infantile paralysis and of how these functions have been influenced by the disability situation. Such a study is contemplated by the writer for a future report.

The re-establishment of "mental awareness" by passive motion and by sensory stimulation, and the correction of "mental alienation" by re-education are therapeutic goals which Miss Kenny stresses principally in her treatment. She apparently achieves these goals by employing two well-established methods of psychotherapy; namely, "reassurance" and "suggestion" in conjunction with physical therapy. Suggestion accompanied by reassurance can exert a strong and lasting influence on dissociation whether the latter occurs normally or psychopathologically. It is an important aid to any form of physical therapy especially as it is employed by Miss Kenny. As in the case of dissociation, psychiatrists cannot give a mechanistic explanation of just how suggestion works. It is known, however, that it does work by exerting a strong influence over emotional forces within the individual; and that these emotional changes, in turn, can influence to a marked degree both psychobiologic and physiologic processes within the individual.

In the Kenny Clinic both reassuring and suggestive influences are brought to bear upon the patient. Upon entering the hospital the patient finds himself in a cheerful, hopeful, confident atmosphere which is reflected in the attitude of the entire staff, and in which the patient soon is participating wholeheartedly. Immediately after the acute stage of the illness has subsided, the attendant assists the patient through passive motion apparently restoring proprioceptive function to the personality, or, in the Kenny terminology, restoring "mental awareness." As a means to this end, the attendant traces her finger over the skin area along the exact course of the muscle which is undergoing treatment from the point of insertion to its origin. In this manner she associates with the aid of suggestion the more specific tactile sensory functions with the less specific proprioceptive functions of the patient's consciousness. She then instructs and assists the patient in active motion. Particular care is taken that the patient re-learn the exact physiologic action of each muscle and each group of muscles affected. Under no circumstance is the patient permitted to use a muscle incorrectly. Some of her patients actually learn to identify by name and physiologic action all of the important muscles of the body and derive pleasure from this accomplishment. Responsibility for correcting defects in function rests upon the patient's ability to respond to suggestion and re-education with physiologic improvement; not upon the therapist's ability to make some new adjustment in a piece of mechanical apparatus. By thus concerning itself with these intricate proprioceptive and motor functions of the personality, the Kenny method restores maximum efficiency and grace to muscular activity and therein differs from the older methods which were contented with any pattern of muscular activity as long as mere locomotion of the body as a whole was achieved. This latter achievement often resulted in awkward and ungraceful muscular movement. It is known from other studies that patients afflicted with infantile paralysis become acutely sensitive to this type of awkwardness, and

that a strong need or striving for gracefulness of movement arises within them. This striving, which is usually awakened during the maturing process of adolescence, can influence personality functioning profoundly. Mechanisms involving the entire personality, including the functions of the muscular system, are employed to revive gracefulness of muscular movement, to compensate for its absence, or to cover up awkwardness (7).

In the Kenny method the indication by the attendant that she believes the patient capable of a given movement suggests to the patient that active motion of the muscle or muscle group is, in fact, possible. The patient is cheered by this. His entire personality becomes organized for the task at hand, namely, the relearning of efficient, coordinated active motion. As his confidence and enthusiasm increase, he takes an increasingly active and responsible part in the therapy. On the other hand, anxiety, depression or deeply seated attitudes, both normal and psychopathologic, directed toward the body and the body image or the external environment, may interfere with this process. It seems very likely that, because of this interference in some patients, the duration of "mental alienation" is thereby lengthened. In the older methods of treatment undesirable emotional reactions were produced in patients because, all too often, a general environmental and sociologic attitude of gloom and dread of the disease prevailed rather than the expectancy of effective treatment. Furthermore, the method of splinting and immobilization over a long period of time must have suggested to and eventually fixed on the patient the belief that active movement of the affected limb was not only undesirable but impossible.

Miss Kenny states that every effort is made to complete each exercise with success so that a feeling or impression of failure is not carried from one exercise to the next. This general principle is essential to any form of psychotherapy. If the patient accidentally performs a correct movement of which he had been incapable previously, all exercise ceases for the day so that he will not forget it and also so that over-enthusiasm on the part of the attendant, the patient, or the parents will not bring about fatigue by repeated testing and exercising. "Thus, instead of pessimism at ultimate failure he goes through the day with a feeling of elation. The consequence is that the next morning the suppressed desire increases his concentration on the effort, his determination to do better and his conviction of ultimate cure" (6). Miss Kenny states further that the attendant must be able to sense just what "mental" effort the patient is making. If this effort reveals indifference or the movements are incorrect, the exercise is discontinued until better cooperation can be obtained. A regimen such as Miss Kenny establishes for her patients affords the patient the emotional security of a meaningful routine and also provides daily goals for which to strive and by which progress may be measured.

The question has been raised whether or not Miss Kenny's success, as in the case of certain uncritical therapeutic enthusiasts, has been based solely upon what one might call uncontrolled suggestion emanating from a dominant or over-enthusiastic personality. Although hers is certainly an imposing, if not dominating, personality, there is no question that this criticism can be ruled out completely inasmuch as Miss Kenny's suggestive influence over the patient is remarkably well controlled psychotherapeutically. The essential controlling factor in the Kenny treatment is the fact that the patient must play an increasingly active role and take an integral responsibility in the therapy before suggestion will accomplish its purpose. His confidence, therefore, is directed repeatedly to his own abilities and not to those of the therapist. This is in contrast to the type of suggestive therapy wherein all the physician demands of the patient is an exclusive and uncritical confidence in what he (the physician) says, does, or administers to the patient. This latter method limits effort on the part of the patient and may lead to an undesirable dependence on the physician. This situation is carefully avoided in the Kenny treatment. Furthermore, it is apparently a fact that essentially comparable results are obtained by attendants with widely varying personalities but with strictly similar technical training. Nevertheless, it may turn out that a closer study of these factors will show significant variations in results occurring with different attendant-patient-physician relationships depending on the personalities involved.

The criticism has also been made that while Miss Kenny has an unusually keen understanding of muscle anatomy and the mechanics of muscle physiology she is not so well grounded in neuropathology. This is no doubt is true but it has a deeper significance in terms of present day trends in medical thought and is, in fact, the basis on which her therapeutic success rests. Until the

present time medical thought and knowledge have been tied quite rigidly to the cellular pathology of Virchow which is more or less committed to the philosophy that the explanation of all disease processes will be found ultimately in pathologic cellular changes. Miss Kenny, not having been schooled in neuropathology, has not been preoccupied with this belief in the pre-eminence of cellular pathology as a determinant of clinical symptoms. On the contrary, she has recognized intuitively and empirically the role played by organismic reaction in the formation of clinical symptoms. She, therefore, has been free to direct her therapeutic interests to those muscles whose functions were in part, at least, still potentially available to the organism, and did not persist in dealing with those muscle functions which had already been irreparably destroyed by anterior horn cell disease. Furthermore, she learned to deal with the neck, trunk and extremities as functioning muscular organs whose bony structures play secondary supporting roles; not primarily as bony structures whose muscular attachments are of secondary motor importance. Miss Kenny's therapeutic approach, therefore, is essentially a psychobiologic one which deals primarily with the completely integrated organism as represented by "the patient." It emphasizes soft parts, function and re-education, rather than bone, structure and surgery (including surgical equivalents like splinting). In re-education the completely integrated organism, i.e. "the patient," plays an intrinsic and active role in the treatment, whereas in surgery and splinting all that the individual patient contributes to the therapeutic situation is the structure which is to be subjected passively to a mechanical manipulation by an outside agency. These principles are being recognized and utilized increasingly in this and other military hospitals in the treatment of soldiers with other orthopedic immobilities, notably fractures (4, 5). While it is necessary that medical science discover whether or not the symptoms described by Miss Kenny are based upon neurophysiologic or structural changes, it is important that psychobiologic considerations not be excluded from these studies. To do so would only perpetuate the one-sided attitude concerning the role of cellular pathology commented on here.

The concepts "loss of mental awareness" and "mental alienation" have been the subject of much controversy and are not fully accepted by many observers. Except for the use of the word "mental," these terms are descriptive enough, from a common sense point of view, and the concepts have certainly served Miss Kenny well in her work. From the point of view of medical terminology, however, their chief disadvantage lies in the fact that the terms employed do not possess the validity that goes with common medical usage. If, however, as seems possible from the foregoing remarks, the concept, "loss of mental awareness," is regarded as essentially the same as "psychosensory (proprioceptive) dissociation" and the concept "mental alienation" as "psychomotor dissociation" it would be possible to use concepts which already have the advantage of medical validity by virtue of well-established usage in psychobiology and psychiatry. It would, therefore, no longer be necessary to regard these phenomena as essentially something new in the field of medical knowledge. Nevertheless, aside from this disadvantage, and minus the word "mental," Miss Kenny's terminology is fundamentally quite appropriate.

"Muscular incoordination" (to be distinguished from incoordination of central nervous system origin) as described by Miss Kenny appears to be the natural consequence of "loss of mental awareness" and "mental alienation" as well as of pain on movement, of muscular spasm and of actual paralysis. If this is so, "muscular incoordination" may be expected to have a psychobiologic significance which is related to that of "loss of mental awareness" and "mental alienation." It is, apparently, the psychobiologically integrated organism's way of dealing with its inability to contract properly certain muscles. Physiologically it is described by the Minneapolis group as "principally of two types: 1. That due to the spreading of motor impulses intended for a certain muscle to other muscles or groups of muscles due to such conditions as pain on attempted motion of the involved muscle or inability of that muscle to perform its proper function. 2. That occurring within the involved muscle itself so that ineffective contraction is produced instead of a coordinated rhythmic contraction producing maximum motion at the insertion of the muscle." Psychobiologically, however, "muscular incoordination" appears to be secondary to the symptoms enumerated above and apparently is the first of a long series of substitutive and displacement mechanisms and adjustments, which, if not checked by physical and psychiatric treatment, accompany the patient throughout the remainder of his life.

A preliminary study of these adjustments (7) which was made recently yielded evidence to show that not only do muscles that are functionally associated with "alienated" and paralyzed muscles take over the functions of these muscles but that in some individuals, depending on personality make-up, other muscle groups, even those as remote as the facial muscles may show a compensatory increase in activity. In the case of the facial muscles, the greater mobility provides an avenue for greater range of expression, vivaciousness and forcefulness to the personality which has been handicapped otherwise by deformity and disability. This study also demonstrated that, in addition to this compensation and substitution mechanism, an active, mobile facial expression, in some individuals, serves constantly to divert the attention of others to the face and away from the deformed part. Changes as remote as these from the disability come about through the medium of changes and adjustments in personality rather than directly from mechanical imbalance. A number of other personality adjustments and reactions, muscular and non-muscular, constructive and destructive, were observed. The essential point in all these adjustments was that personality assets as well as liabilities based on latent personality tendencies were given impetus for fuller development by the handicap of deformity and disability.

SUMMARY

In addition to being studied as a function of the neuromuscular system, muscular activity should be studied also as a function of the total organism as embodied in the concept of the personality and its functions. "Mental alienation" is composed of a sensory factor ("loss of mental awareness") and a motor factor ("mental alienation" in its narrower sense) and is therefore not one but two distinct though related symptoms. From the definitions and descriptions of "loss of mental awareness" and "mental alienation" given by Miss Kenny and her associates, it cannot be stated with certainty what roles structural, physiologic and psychobiologic changes play in their production. There are certain aspects of these symptoms which bear a resemblance to well recognized psychobiologic and psychopathologic reactions. "Loss of mental awareness" seems to correspond to psychosensory (proprioceptive) dissociation and "mental alienation" to psychomotor dissociation. Therefore it appears that these symptoms may be explained more satisfactorily on the basis of psychobiologic dissociation than on the basis of "physiologic block" as has been attempted by the group of physicians associated with Miss Kenny. "Muscular incoordination" also described by this group is a natural consequence of "loss of mental awareness" and "mental alienation" as well as of pain, spasm and actual paralysis and as such is one of several factors in the production of a series of personality adjustments which may stretch throughout the patient's active life. In the treatment of these symptoms Miss Kenny employs a number of well established psychotherapeutic principles. By means of the Kenny treatment it is to be expected that not only will the chronic physical crippling of infantile paralysis be curbed but that chronic changes in personality functioning also will be interrupted. Careful psychiatric study of case material will prove whether the above concept is essentially near the truth, and to what extent personality factors influence the elaboration and persistence of the symptoms "loss of mental awareness," "mental alienation" and "muscular incoordination." Once developed, these symptoms may in turn influence the personality functions of individuals to varying degrees. Finally, this syndrome comprising disturbances in the proprioceptive and motor functions of the personality is not peculiar to infantile paralysis. Rather, it appears to be the psychobiologic reaction to muscular immobilization due to any cause and has as its background not cellular pathology alone but the entire psychobiologic organization of the individual.

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ACCIDENT PRONENESS*

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In everyday experience it is commonly observed that certain individuals have repeated accidents whereas others rarely if ever meet with any mishap. From such observations as these it has been proposed by many different sources that certain people are accident-prone. In other words, accidents don't just "happen"; they occur because certain people have a tendency to make them. In discussing any disease we consider establishment of the disease as an entity, etiology and pathology, symptoms, and treatment. Therefore any complete evaluation of this theory of accident proneness must answer the following questions: 1. Are there accident-prone individuals? 2. What causes accident-proneness? 3. How can accident-prone individuals be recognized? 4. What can be done to decrease the number of accidents due to accident-proneness?

ARE THERE ACCIDENT-PRONE INDIVIDUALS?

Four large industrial concerns (10) employing 1400 drivers of trucks and commercial cars have investigated the possible causes of accidents one by one to determine the key factor. Their findings were as follows:

1. *Weather.* As can be seen from the following table the majority of accidents take place in clear weather although only one third of the days of the year are clear. Rainy and snowy weather although theoretically more hazardous have a lower percentage of accidents. Thus the vast majority of all accidents take place under ideal weather conditions:

Type of day	Per cent of days in year	Per cent of accidents
Clear	30	75
Cloudy	30	3
Foggy	5	1
Rainy	25	14
Snowy	10	7

2. *Pavement.* As can be seen by the following table the vast majority of accidents occur on dry non-defective pavement:

Type of pavement	Per cent of accidents
Defective	3
Non-defective (dry)	63
Non-defective (icy or snowy)	15

3. *Season.* The seasonal incidence is variable. In some years there is a higher incidence in summer, in others the incidence is higher in winter.

4. *Day of the Week.* The first five days, which are the only comparable ones in this survey, showed no variation in the accident rate.

5. *Defective Equipment.* In this survey all cars were inspected before they were taken out. They were refused if found to be defective in any way.

6. *Experience.* All the men who were used in this survey had five to ten years driving experience. In another survey by the State of Connecticut it will be shown that youth and inexperience may play an important role in the production of accidents.

7. *Speed.* Ninety per cent of the commercial cars had governors restricting the speed to less than 45 miles per hour. The trucks were restricted to even slower speeds.

All the above investigations point to the fact that the vast majority of accidents take place under apparently ideal driving conditions and seem to indicate the driver as the only remaining important cause of the majority of accidents. With respect to the driver, the following statistics may be found:

Per cent of workers or drivers	Having per cent of accidents	Source
4	36	Conn. Veh. Bur. (2)
15	100	Fortune (3)
29	67	Dunbar (quoted)
0.8	10	Heinrich (5)
25	Majority	Culpin (quoted by Ling (6)
33	100	Slocombe (quoted by Dunbar) (4)
13	Over 50	Slocombe (quoted by Dunbar) (4)
27	55	Slocombe and Brakeman
5	30	Nat'l Research Council (1)
10	Over 50	Nat'l Research Council (1)

Although these figures vary widely it may readily be seen that a relatively small number of

* While this article is not a comprehensive review of the literature and much of the material in it has not been brought up to date, we feel the topic important and timely enough to justify notice—Ed.

individuals have a relatively large number of accidents. These figures as they stand are of doubtful value, however, for it might readily be said that if there are definitely fewer accidents than there are drivers, a fraction of the group will obviously have all the accidents. Indeed the investigation of Connecticut drivers (13) showed that 29,531 drivers had only 7,082 accidents in the period of time studied. If the drivers having accidents had one each, 24 per cent of the drivers would have 100 per cent of the accidents. However, the expected and actual accident rates were compared with the following results:

No. of accidents per driver	No. of drivers	
	Actual	Expected
0	23,881	23,234
1	4,503	4,572
2	936	668
3	160	53
4	33	4
5	14	—
6	3	—
7	1	—

The above table divides the drivers into two separate groups. Those with none or one accident correspond fairly closely with the expected number. In fact the number of accident free individuals is slightly greater than would be expected. Thus this group fits in with what would be expected if accidents were purely chance occurrences to which all were equally susceptible. The high rate group (two or more) greatly exceeds the chance expectation, however. Thus we may conclude that a small number of people have multiple accidents whereas the majority have one or none.

This in itself is still no indication of accident-proneness, for accident-prone people always have accidents. The following table shows the accident rates of the above groups over two different periods:

Accidents per Driver

Accident group 1931–1933	Same groups 1934–1936
0	0.101
1	0.199
2	0.300
3	0.484
4	0.700

From this table it may be seen that the same groups which had the high rates during the first three years had the high rates during the second three. This finding is confirmed by the four companies mentioned above. Lastly it remains to be shown that accident-prone drivers are accident-prone in everything. Quoting the Connecticut figures again, the following is revealed:

No. of drivers	Personal accidents per driver	Traffic accidents per driver
109	0	1.29
73	1	2.47
43	2	2.74
44	3	3.50
16	4	3.75
12	5	3.00
11	6	3.63
5	7	5.40

In other words, accident-prone individuals are accident-prone in any occupation. This fact was also determined by one of the companies mentioned above. This company transferred its accident-prone drivers to other jobs and found that the accident-proneness continued.

As a final test of accident-proneness one of the industrial concerns mentioned above (10) attempted to reduce the accident rate by weeding out the accident-prone drivers. The results follow:

Year	Total miles traveled	No. of accidents	Av. miles between accidents
1928	2,373,109	201	11,806
1929	2,687,219	207	12,981
1930	2,666,496	148	18,016
1931	2,880,703	132	21,823
1932	2,394,875	69	34,708
1933	2,373,075	58	40,915
1934	2,446,243	43	56,889
1935	2,646,440	47	56,307

The weeding out process was begun in 1930 and since that time the accident rate has been reduced to almost one fifth its original level. Thus in summary the majority of accidents are the fault of the driver rather than weather conditions, equipment or any other factor. A small group of people have a tendency to have multiple accidents and have the majority of all accidents. This group is constant from year to year and from one occupation to another. The accident rate may be reduced by weeding them out. In conclusion it may be said that there are accident-prone individuals.

WHAT CAUSES ACCIDENT-PRONENESS?

Having established that accident-proneness is a true entity, the next logical step would be to determine its etiology. As has been shown in the preceding section, accident-proneness concerns the in-

dividual exclusively and is not to any extent ultimately dependent upon the circumstances or environment existing at the time of the accident, for an accident-prone individual has mishaps in business as well as in private life and in any occupation. The circumstances may and probably do act as the immediately precipitating factors as will be discussed presently. However, accident-prone persons react to these factors in a way which results in an accident whereas non-accident-prone persons do not.

Let us examine in turn the physical, mental and emotional conditions of accident-prone people. Heinrich (8) states that only 3 per cent of all accidents can be attributed to physical defect or incapacity. Moreover, the custom of physical examination of employees by the majority of large industrial concerns would seem to preclude physical disability as a major cause for accidents. According to Heinrich less than 1 per cent of all accidents may be attributed to subnormal intelligence as determined by psychometric tests. Moreover, it has been determined independently by Smith and Greenwood (14), Iowa State College, the Connecticut Department of Motor Vehicles and the Harvard Bureau for Street Traffic Research (13) that neither slow reaction time, low intelligence, nor any other factor which can be determined by psychometric tests distinguishes accident-prone from other individuals. Although the majority of investigators feel that this is the case, it might be mentioned that Barthe (2) has reported that accident-prone individuals seem to have an increased time for the duration of a given reaction.

It is an established fact that young individuals are accident-prone. In support of this the following tables are presented. The Connecticut Department of Motor Vehicles (13) reports:

Age	Deaths per 100,000 drivers
16	201
17	186
18	148
19-21	215
46-50	66

The district of Columbia (2) reports the following:

Ratio of Actual to Expected Number of Traffic Accidents

Age	1934	1935-6
16-20	1.16	1.25
21-25	1.14	1.34
26-30	0.995	1.16

The same source reports that the suspensions for speeding of the group from 16–26 years are 2.3 times the expected frequency calculated on the basis of equal liability. It is readily seen that individuals below 25 years of age are markedly accident-prone at least as regards driving. According to skill tests conducted by the above sources the younger age group is superior to the older as regards driving ability. If the causes of the high accident rate among young drivers were poor judgment due to lack of experience we would not expect the 16–20 age group to have a lower rate than the 21–25 group. Other sources (13) report, however, that the group under 21 has 1.24–2.10 the expected number of accidents as compared with 1.29–1.65 the expected number in the group from 21 to 25. Heinrich states that less than 8 per cent of all accidents can be attributed to lack of skill. As lack of skill and judgment seem inadequate explanations, the high accident rate among young drivers may have to be explained in terms of some of the factors to be discussed presently.

Heinrich states that 22 per cent of accidents in his survey were due to inattention. The significance of this figure may be questioned in view of the difficulty of determining this factor. There can be no doubt, however, that inattention plays a part in accident causation. Circumstances concerned with the production of inattention are unlimited in number but they may be roughly divided into changing conditions such as domestic or financial troubles, fatigue, interference, etc., and fixed conditions such as neuroses, phobias, and personality difficulties. The former group would not cause repeated accidents in the same individual over a long period of time. The latter group, however, might well play an important part in the production of an accident-prone person.

Secondary motives may play a large part in accident production, both in prone and in non-prone individuals. As is brought out by Ackerman (1), accidents may successfully help the injured person to avoid disagreeable or dangerous situations. In the World War soldiers were frequently observed to have sustained incapacitating minor injuries just before being ordered over the top. Dunbar (4) cites the case of a Roman Catholic woman who unexplainedly broke her hip on the way to confession at which she would have had to admit the use of contraceptives. Evasion of responsibility, monetary benefits (compensa-

tion), attention and sympathy are all secondary motives which frequently play a part in accidents.

Accidents seem to predispose to more accidents (13). Repeaters tend to shorten the time between successive accidents. For example, the length of time between the third and fourth accident is usually markedly shorter than the length of time between the second and third.

It has been frequently observed that a great many accidents are caused by what Ackerman calls a "primary motive." That is to say, these accidents are purposive in character. He quotes the following by way of example:

> "A youth was driving his mother on a shopping tour. He begged her for the use of the car for a fishing party the following day. She refused, whereupon he fidgeted angrily, 'accidently' stepped on the accelerator and sent the car into a ditch, injuring both himself and his mother."

This "primary motive" seems to be an expression of a self destructive tendency due to guilt feeling, or of a tendency to destroy others as an expression of hatred. Freud terms the tendency to act out this purposive destructive tendency the "traumatophilic diathesis." As will be shown presently by statistics, the majority of accident-prone people seem to have this tendency to act out their hate or guilt feeling. The explanation is not so far-fetched as it might at first appear. Primitive men and children consider all "accidents" to be purposive. The concept of "accident" is inculcated in a child by repetition. It becomes a useful way of denying purpose and provides a convenient cloak for hostility. Consider the following example also quoted by Ackerman:

> "A mother while scolding her child rocked too energetically on her chair and bumped the child's head. The child started to cry, but the mother soothed it by explaining that the bump was 'just an accident'. An hour later at dinner the child spilled a bowl of hot soup on the mother's lap and before it could be scolded, it volunteered that the occurrence was an 'accident'."

Because of the early taboo against interpersonal hostility the tendency is soon developed in children to hurt themselves in lieu of the person toward whom the real hostility is directed. In temper tantrums children stamp their feet, bang their heads, pull their hair, hit, scratch and bite themselves. Older children become more subtle and have repeated accidents usually caused by taking absurd risks such as jumping down a flight of stairs.

From this it is but a step to the still more subtle accidents of adults: Heinrich, for example, mentions a certain industrial plant employing 6600 people. It was noticed there that certain individuals had repeated sore fingers, minor cuts, and sprains. All these injuries were insufficient for compensation or even time off so that secondary motives were ruled out. The major accidents also occurred in this group. He mentions one man who had 37 different accidents in less than two years.

Although the above explanation for accident-proneness is merely a theory it is strongly supported by certain statistics. Dunbar (4) has studied a group of 1300 ward patients at the Presbyterian Hospital and found the following: Four times as many fracture patients as cardiac patients give a history of previous accidents. Only a fraction of one per cent had more than one accident in the cardiac group whereas two thirds of the fracture patients had more than one accident. Of these half had three or more and one patient had as many as 27. It is extremely difficult to distinguish a "true" or "innocent" accident from one that might conceivably be purposive, but insofar as these can be distinguished it was found that the percentage of "true" accidents was markedly lower in those patients with numerous accidents. Twenty-two per cent of the cardiac patients were found to have had previous accidents. The analysis of these accidents and the most recent ones of the fracture group into "true" and "personality-factor" accidents follows:

	Per cent of patients having true accidents	Per cent of patients having personality-factor accidents
Cardiacs	10	12
Fractures	10	90

From the above it may be seen that there seems to be a constant figure for the "true" or "chance" accidents which do not involve accident-proneness. The high figure for personality-factor accidents found in the fracture group which consisted to a very large extent of accident-prone individuals corresponds well with Heinrich's statement that 88–90 per cent of all accidents in the high-rate group are personal. Although the figures presented cover too small a series to be conclusive, they nevertheless strongly suggest that a personality-factor of some sort plays a part in the high accident rate group. What is this factor?

Shortly after their injury 60 per cent of the fracture patients made a confession of guilt or resentment as related to the accident or endowed the accident with a purposive character of some sort. Only 1 per cent of the cardiac patients viewed their illness in this light. Some examples follow:

A 16-year-old Puerto Rican said: "It was really my fault because Mother said supper was ready and I was not to go out. I went out anyway, got into a wrestling match and got my arm broken. Anyway, I guess Mother's sorry she's so strict with me."

A 27-year-old woman was hurt sliding down a bannister. She had always worked off annoyances with her parents and later with her husband by such tricks. "Perhaps I ought to know better but it wouldn't have been like that if they had had more sense, and had treated me more like a person instead of being so strict."

A secretary fell and fractured her hip. "I asked my friends why I must be punished so. I can't remember ever having done anything wrong, but I must have done something terrible."

Another frequent query is "Why did this happen to me." This reaction occurs only in the first day or two following the injury and, if not elicited immediately, is usually missed. If the fracture patients in the series dealt with above could all have been seen immediately following the accident, a much higher percentage of "confessions" might have been obtained. The reaction is rapidly suppressed and following it the patient staunchly protests his innocence and emphasizes his desire for compensation. As will be discussed presently there is a marked tendency for these people to cling to the secondary illness gain as contrasted with the cardiac's desire to get up and about as soon as possible. In this manner secondary motives may play a large part in the production of the accident-prone group.

It has been shown above that young people are accident-prone. The work of Dunbar (5) offers an explanation for this. Considering the series worked with above, it was found that the fracture patients were distributed in the different age groups as follows:

	15–24	25–34	35–55
Total	35	30	35
With previous injury	47	21	32
Without previous injury	19	41	40

From this it is seen that it is the younger age group which accounts for the majority of people in the accident-prone personality-factor group. This may be contrasted with the cardiac group in which the older age group had the majority of accidents. The distribution of cardiac patients who had accidents is as follows:

	15–24	25–34	35–55
Total	26	29	45
With previous injury	28	23	49
Without previous injury	25.3	30.3	44.4

Thus it is reasonable to suppose that the accident-proneness of youth is to a large extent the accident-proneness of the primary motive. Dunbar believes that youth predominates in this group merely because of the short expectation of life in the accident-prone group.

In summary it has been shown that the weight of evidence thus far points to the "primary motive" or "traumatophilic diathesis" as the principal factor in accident-proneness. Youth is probably not a factor in itself but seems secondary to the short expectation of life in the accident-prone group. Secondary gain or motive is closely tied up with the personality of those exhibiting the primary motive in many instances. The various incidental and changing conditions play no part in accident-proneness, nor do reaction time, intelligence, physique, or skill play any significant role.

HOW CAN ACCIDENT-PRONE INDIVIDUALS BE RECOGNIZED?

For the individual case it may be said at once that there is no definite way of detecting accident-proneness except from the previous record. With regard to this the National Research Council (1) reports that the future performance can be predicted from the past record in five-sixths of the cases studied. Dunbar (4, 5), however, has made a study of a large number of accident-prone individuals and reports that the group as a whole has two very definite characteristics. The first concerns their attitude toward the external world, the second concerns their reaction to it. As the latter bears a simple and obvious relation to accident-proneness, it will be considered first.

Accident-prone individuals tend to respond to stimuli by action rather than by thought and brooding. They are relatively inarticulate and thus tend to act things rather than to express them in words. From early childhood on they respond to strong emotion by impulsive acts. As children they may run away from home, be revengeful, lie, steal or even murder. They frequently have early neurotic traits such as nailbiting, enuresis and truancy of very extended duration. Their behavior is very impulsive in character. They are

always in a hurry, are frequently under tension and usually heavy smokers. In connection with this physical response they often take a great interest in sports and in the development of their bodies or become especially preoccupied with powerful machinery. They are frequently boastful and like to take long chances (although they seem to be less likely to get away with them than most people). They are unable to bear severe pain probably because of this tendency to act things out rather than suppress them or express them in other ways. Also tied up with this characteristic is the fact that the group contains many eccentrics but very few psychoneurotics.

The other characteristic of the accident-prone group is the tendency to avoid compulsion both in the form of authority and in the form of responsibility. Nearly all the accident-prone individuals studied had stern parents who lived well into the patient's adolescence and to whom the patients were never able to adjust. In later life these same individuals were unable to adjust to employers, social or religious institutions. They had irregular work and school attendance record as compared with other groups. They never finished an incompleted education in adulthood as did members of other groups among the patients studied. They were generally asocial. The dislike of responsibility is brought out by the conflict which most of the members of the accident-prone group have over earning their own living and establishing their independence. It is because of this that so many of them tend to cling to and prolong their illnesses and to insist on compensation. In addition there is a very high percentage of childless marriages in the group, and families tend to be very small, only 5 per cent having more than two children.

The poor judgment which characterizes most members of the group may be an expression of the dislike of the responsibility of making a decision or might be the result of the impulsive tendency to act things out.

The group as a whole tends to have an extraordinarily low incidence of mild infectious diseases such as colds and also a very small number of operations.

In summary it is seen that the accident-prone group as a whole is characterized by an impulsive tendency to act things out and also by an avoidance of authority and responsibility. These characteristics are not applicable to the individual, however, and at present accident-prone individuals can be recognized only on the basis of their past record.

HOW CAN ACCIDENTS DUE TO ACCIDENT-PRONENESS BE PREVENTED?

The simplest and most obvious solution to the problem of accident-proneness in industry is to eliminate accident-prone people from the list of employees. This very method was used by the industry referred to in the first part of this paper (1) with the result that the number of automobile accidents it had was reduced to one fifth the original figure and the average number of miles between accidents was increased five fold. Although this method is very effective and might be applied in selected instances such as in issuing drivers' permits, it is nevertheless too drastic to be generally applicable. Although the accident-prone group consists of only a very small percentage of the general population [estimated at about 4 per cent by the Conn. Bureau of Vehicles (2)], it includes a large number of persons in absolute figures, and it would not be very practicable to keep these people out of work. Moreover these people would continue to have accidents in private life. It is evident therefore that this method may be a solution for a certain situation, but will not solve the problem of accident-proneness as a whole.

The only true solution, then, is to actually prevent or correct the accident habit. This is a problem for the psychiatrist which has as yet not been completely worked out. Dunbar (4), however, outlines certain procedures which indicate the path to be followed. First of all special attention must be paid to early neurotic traits which, as already discussed, may be prodromata of the accident habit. Proper psychotherapy after the first accident may well prevent the development of a habit. Psychotherapy should be instituted immediately after the accident, and the guilt feeling should be relieved before it is repressed. In addition to tending to prevent the formation of an accident habit, this procedure decreases concentration on the injury and leads to faster recovery. Excessive spoiling or severity during the illness should be avoided as this encourages impulsive and delinquent tendencies. With regard to the secondary illness gain, one should not be too rough with the patients as they are not conscious malingerers.

In summary, elimination provides a solution for certain selected instances, but the ultimate handling of the accident-habit depends on psychotherapy which is as yet impracticable on a large scale.

SUMMARY AND CONCLUSION

Statistics have been presented to show that accident-proneness is a definite entity and a number of possible causes for accident-proneness have been presented. From the evidence now at hand it seems fairly certain that the existence of accident-proneness is an actual fact. The various explanations for accident proneness are not on such a firm basis, however. The attempt of Dunbar and others to explain accident-proneness on the basis of a traumatophilic diathesis has led to some strongly suggestive statistics. The series worked with, however, was not a very large one, and as yet no other adequate series has been reported by other sources. The problem of secondary gain has not been gone into statistically, and the explanation for the accident-proneness of youth is by no means adequate as it has been worked out to date.

Accident-proneness can be predicted at present only on the basis of past record. It has been shown that accident-prone people have certain definite characteristics of personality which, if further studied, may be a valuable aid to prediction.

Accidents due to accident-proneness may be prevented only by elimination of accident-prone people at present. It has been shown, however, that further study may enable the psychiatrist to prevent the formation of the accident habit, and even cure accident-proneness which has become established.

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MEETINGS

A special meeting of the American Society for Research in Psychosomatic Problems, Inc., was called on Friday, December 17th, 1943, in the Neptune Room, Hotel Pierre, New York City, in conjunction with the meeting of the Association for Research in Nervous and Mental Diseases. A short business meeting was held to vote on the incorporation of the American Society for Research in Psychosomatic Problems, as required by the Membership Corporations Law of the State of New York. The program was as follows:

5:00 P.M.

Business Meeting (Members Only)

5:30 P.M.

Moving Picture: Experiments on the Revival of Organisms (Comment by Professor Haldane) from the Moscow Institute of Experimental Medicine

8:30 P.M.

Open Meeting: Psychosomatic Implications of Pain—TRACY PUTNAM, M.D., *Chairman*

"Pain": A Review of the Proceedings of the Association for Research in Nervous and Mental Diseases—CARL BINGER, M.D.

Measurements of Pain Sensitivity—WILLIAM CHAPMAN, M.D. and CHESTER M. JONES, M.D.

Discussion—FLANDERS DUNBAR, M.D.

Intermission

Pain and the Heart—MACK LIPKIN, M.D.

Discussion—EDWARD WEISS, M.D.

Animal Behaviour Studies Bearing on the Problem of Pain—HOWARD S. LIDDELL, PH.D.

Discussion: JULES H. MASSERMAN, M.D.

Summary for Discussion—GREGORY ZILBOORG, M.D.

(1) *Committee on Psychosomatic Problems in Internal Medicine.*

At a meeting of the Committee on Psychosomatic Research on October 19th Dr. Sidney Portis, who had been appointed temporary Chairman, recommended appointment of the following sub-committees: Committee on Cardiovascular Diseases, Committee on Gastrointestinal Diseases, Committee on Cutaneous and Allied Diseases and Committee on Endocrinology. Since that time these committees and their chairmen have been appointed:

(1) *Committee on Cardiovascular Diseases*
DR. EDWARD WEISS, Chairman

(2) *Committee on Gastrointestinal Diseases*
DR. SIDNEY PORTIS, Chairman

(3) *Committee on Cutaneous and Allied Diseases*
DR. JOHN MILLET, Chairman

(4) *Committee on Endocrinology*

(2) *Committee on Psychosomatic Problems in Obstetrics and Gynecology*
DR. RAYMOND SQUIER, Chairman

This committee has under way a survey of the literature in the field and a meeting is scheduled for January.

(3) *Committee on Psychosomatic Problems in Early Infancy and Childhood*
DR. MARIAN PUTNAM, DR. IVES HENDRICK, Co-chairmen

The second meeting of this committee was held at the New York Hospital on August 3rd, 1943. Plans were made for a conference which was held at the New York Hospital on December 3rd and 4th. In order to facilitate the exchange of information and ideas on an informal basis, the conference was restricted to forty persons known to the Committee to have interest in and to have made research in this field, and an effort was made to obtain as wide a geographical representation as possible. The program was as follows:

Psychosomatic Problems of the Infant at Birth

Friday, December 3rd, 1943

2:00 p.m.

DR. LESTER W. SONTAG, *Chairman*

Differences in and Modifiability of Fetal Behaviour and Physiology—DR. LESTER W. SONTAG

Structural and Functional Alterations in the Brain Following Neonatal Asphyxia—DR. WILLIAM F. WINDLE

Discussion—DR. SAMUEL Z. LEVINE

Saturday, December 4th, 1943

9:30 a.m.

DR. C. ANDERSON ALDRICH, *Chairman*

Effect of the Mother's Emotional Attitudes on the Infant—DR. H. FLANDERS DUNBAR
Psychosomatic Relationships between Mother and Infant—DR. MARGARET FRIES
Questions Relative to Colic and Pyloric Stenosis in the Infant at Birth—DR. BENJAMIN SPOCK

2:00 p.m.

LAWRENCE K. FRANK, *Chairman*

General Discussion of Psychosomatic Research Problems of the Neonatal Period

Part of the proceedings of this meeting will be published in the journal and full proceedings may be obtained in printed form at a later date.

At a meeting of the committee held at this time Dr. Milton Senn was elected chairman. It was decided that the committee would make a survey or research being done in the field of pre-natal and post-natal periods. It was also decided that at the next meeting psychosomatic case histories would be presented. It is hoped that from a discussion of these case histories it will be possible to adopt a case history form which can be used both in teaching medical students and by pediatricians in the field. Such discussion might further highlight areas in which further research may be made into the problems of psychosomatic dysfunction in early infancy and childhood.

(4) *Committee on Psychosomatic Implications of Animal Experimentation*

DR. HOWARD S. LIDDELL, Chairman

A meeting of this committee was held on December 18th and formulated plans for a conference to be held prior to the annual meeting of the Society in Philadelphia on May 13th.

(5) *Committee on Psychosomatic Problems in Physiological Mechanisms*

Dr. Ralph W. Gerard has been appointed chairman of this committee replacing Dr. Hallowell Davis. Dr. Gerard is now appointing members and a meeting will be held in the near future to outline a program of research.

(6) *Committee on Psychosomatic Problems in Medical Education*

DR. JOHN ROMANO, Chairman

This committee has sent a questionnaire to the Professors of Medicine and Psychiatry of the leading colleges in the United States and Canada, the purpose of which is to ascertain the extent to which psychosomatic medicine is being taught, the methods of teaching, and plans, if any, for its inclusion in the curriculum. A full report of the results of this questionnaire will be presented at the annual meeting.

(7) *Committee on Psychosomatic Aspects of War Medicine*

DR. HARRY SOLOMON, Chairman

This committee held a conference in Washington on November 1st. This was attended by members of the British and Canadian Medical Corps as well as by leading representatives of American Military and Civil Medicine. The purpose of the meeting was to discuss ways in which this Committee might be of service in the war effort and to formulate plans for carrying out the suggestions made by those present.

This committee reports with deep regret the loss of one of its most active and helpful members in the death of Colonel Roy D. Halloran.

(8) *Committee on Psychosomatic Approach to Social and Cultural Problems*

LAWRENCE K. FRANK, Chairman

A preliminary conference was held on September 15th to discuss the various proposals which had been formulated and the areas in which this committee might function was well as to consider proposals which had been made for specific research projects.

Two sub-committees were formed,

(1) *Committee on Study of Illness among Children of Different Cultural Backgrounds*

DR. MILTON SENN, Temporary Chairman

It is proposed that this committee undertake three separate but interrelated steps to advance this study, which may be briefly described as follows:

(1) A preliminary, exploratory study of existing clinical records to see if there are evidences of unusual incidence of any disorder, illness or defect among children who can be identified as coming from some recognized racial, ethnic or

nationality group with a distinctive culture and pattern of child rearing.

(2) Upon the basis of existing knowledge and present practices, to prepare a form for history taking and clinical recording which, if adopted and put into practice, would serve to accumulate data on this problem.

(3) To prepare a systematic statement of the traditional culture patterns for pregnancy, childbirth, and the care, nuture and training of infants and preschool children for each of the major cultural groups in Europe, including Russian, and for Asia and smaller cultures.

(2) *Committee for Research in Health Insurance*

MR. GEORGE SOULE, Chairman

This committee, without taking a position either for or against a health insurance program, recommends that a study be made of the relation of psychosomatic medicine to the problem of cost and economy in any health insurance plan, and the therapeutic dangers of crystallizing unsatisfactory types of medical practice; that the more prominent plans for health insurance be examined from the point of view of the two points mentioned above, and positive recommendations be made affecting the type of medical service which should be offered under these plans.

(9) *Committee on Psychosomatic Research in Problems of Industrial Medicine*

Several preliminary conferences have been held relative to the appointment of this committee.

(10) *Committee for Research in Projective Techniques*

DR. M. R. HARROWER-ERICKSON, Chairman

This committee will make a study of the application of projective techniques in the field of psychosomatic diagnosis. A meeting will be held in January.

One of the purposes for which the Society was formed was to establish a clearing house for research projects already under way and to initiate research in areas where such work might further the development of psychosomatic medicine. It is hoped that notes on research committee activities will help fulfill these two functions, both by reporting projects already under way and by the inclusion of inquiries or suggestions from interested persons. Further suggestions as to ways in which these notes might be made more informative or interesting are welcomed.

REVIEWS OF PERIODICAL LITERATURE

UNO H. HELGESSON (M.C.) U.S.N.R.: Some current features of psychiatry in the United States Navy. *Am. J. Psychiat.*, **99:** 633, 1943.

During the last war the Navy had the advantage of the services of well-qualified psychiatrists whose experience has been basic in formulating current plans. Lack of coordination and central authority, however, have prevented full profit from past successes and mistakes.

Losses to the Navy through psychiatric conditions do not seem important, for the rate of psychiatric admissions was only 283 per 100,000 in 1939, but if one adds the suicide rate to this figure, the rate of disciplinary discharges and cases recorded as physical conditions but actually of psychopathologic nature, it becomes clear that the admission rate for psychiatric conditions is misleading. These figures do not indicate the extent to which one paranoid or homosexual personality can affect the morale of a ship nor the extent to which "sick bay addicts," who can rarely be counted on in an emergency, take up time needlessly. The petty, harmless offenders, immune to discipline, whose lack of cooperation annoys officers and men alike, constitute another psychiatric problem. They make a good impression on laymen, but a psychiatric examination would be revealing.

The knowledge gained during the past decade in so-called psychosomatic disorders has in general received little attention from the medical profession. It is particularly gratifying that the research division of the Bureau of Medicine and Surgery of the Navy is interested in the subject and has given moral support to research projects concerning this topic by civilian physicians. The opportunity might arrive for studies on naval personnel, which would do much towards solving problems as to the management of such conditions as peptic ulcer and so-called neurocirculatory asthenia.

D. K.

HARRISON, CAPT. FORREST M.: Psychiatry in the Navy. *War Med.*, **3:** 113, 1943.

Psychiatry has demonstrated its usefulness in the Navy to such an extent that it will always be a major specialty there. Statistical data show that the admission rate for mental disease is low when compared with other groups of disorders. During the last war it increased substantially, with relation not to psychosis but to psychoneurosis, mental deficiency, epilepsy and psychopathic states. Since World War I there was a decline in incidence of all mental disorders in the Navy, and since Dec. 7, 1941, the incidence has been below expectation. Because disorders of the mind show a high noneffective rate, the invaliding rate is high, and since 1921 ranks first among the invaliding causes. Whenever a definite diagnosis of mental disorder is made, discharge from the service ordinarily follows. All sorts of mental diseases occur. The psychoneuroses form the largest group in peace as well as in war. Anxiety neuroses, hysteria, neurasthenia and psychasthenia are frequent; situational and traumatic psychoneuroses, relatively rare. In many instances of psychoneurosis a familial and personal history of neuropathy is elicited, but in some the symptoms are referable to previous accident or disease. Hysterical paralysis is rare in the Navy. The psychoses rank next to the psychoneuroses in frequency except in wartime when they fall behind psychopathic states. Then come manic-depressive psychosis, dementia paralytica, exhaustive psychosis, associated paranoid states and alcoholic psychosis. Epileptic psychosis, involutional melancholia, senile psychosis and psychosis associated with organic disorders of the brain and other disabilities are rare. The constitutional psychopathic states, including psychopathic inferiority, constitute the third largest group in peace and the second largest in war. Patients with emotional instability predominate, followed closely by the inadequate personalities.

M. B. J. (From The Neuro-Psychiatric Institute of the Hartford Retreat)

ROSENBERG, MAJOR SEYMOUR J., AND LAMBERT, RICHARD H.: Analysis of certain factors in histories of two hundred soldiers discharged from the army for neuropsychiatric disabilities. *Am. J. Psychiat.*, **99:** 164, 1942.

This paper summarized data drawn from a review of 200 consecutive case histories of soldiers discharged from the Army at Camp Lee, Va., because of neuropsychiatric disabilities. This camp was composed of a reception center and 2 replacement centers. The majority of the soldiers there had not been in the army more than 3 months. In the entire group, 83% presented prominent symptoms for at least 1 year before induction; a little more than half for over 5 years. Of the 11% in which the onset occurred after induction, all but 1 patient were psychotic. Almost half became disabled within the first month of military service; 75% within 2 months; and 97% within 6 months. It is interesting that many of the patients who had symptoms prior to induction did fairly well at home where their symptoms had been accepted, where they had been catered to and protected, and when they worked if and when they felt so inclined. Military duty cannot be blamed for causing their reactions, however. It made them apparent. Many of these individuals showed little desire to effect an improvement in their adjust-

ment. Of the patients who had symptoms of a psychiatric disorder before induction, only ¼ had sought medical attention, and only 6% had received psychiatric treatment. The majority had evidently accepted their symptoms as inevitable or had been satisfied with that outlet for their maladjustment. Only 18.5% of the cases had good work records; many of them did poorly at school also. Thirty-nine and five-tenths per cent had heavily loaded family histories of neuropsychiatric disabilities. Only 40% could be qualified as negative. Most of the psychiatric casualties encountered in this group could have been eliminated at the induction board if relatively simple social service data had been made available.

M. B. J. (From The Neuro-Psychiatric Institute of the Hartford Retreat)

SIMON, ALEXANDER, AND HAGAN, MARGARET: Social data in psychiatric casualties in the armed services. *Am. J. Psychiat.*, **99:** 348, 1942.

A group of 400 psychiatric casualties was studied with special reference to previous mental illness; broken homes; psychosis in the family; education; occupational adjustment; antisocial behavior; alcoholism. Most of the men were voluntary enlistments. Of 200 Army men in the group, 55 (27.5%) had been previously hospitalized for mental illness or had been treated by a psychiatrist before enlistment. For the 200 Navy and Marine Corps men, the figure was 45 (22.5%). There was an unusually large number of broken homes in the background of these men (42.5%) and often a history of behavior problems in childhood leading eventually to frequent arrests, and chronic alcoholism. Frequently there was a history of psychosis in the immediate family (35.2%). There were 8 cases (4%) of psychosis with mental deficiency, and one mental defective without psychosis. All could have been excluded merely on the basis of their educational history. Comparing the background of this group of 400 psychiatric casualties with 788 men who received psychiatric examinations at Selective Service stations, we find that 175 men in the latter group were rejected. Excluding 42 cases of mental deficiency, epilepsy, organic disease or the central nervous system, there remain 133 "functional" cases, of which 63% displayed one or more of the factors mentioned above. Of the 613 men accepted, only 147 (24%) had one or more of the factors. A history of previous treatment for mental illness, frequent arrests for excessive alcoholism, should obviously lead to rejection. The presence of a broken home or psychosis in the immediate family should point to a more extended psychiatric inquiry than in the average case.

M. B. J. (From The Neuro-Psychiatric Institute of the Hartford Retreat)

LEWIS, AUBREY, AND ADELAIDE, F. R. C. P.: Social effects of neurosis. *Lancet*, **244:** 167, 1943.

The neurotic soldiers who are discharged from the Army, when returned to the community, should be of at least as much use and as healthy as they were before they joined the Army. The following study throws some light on this point. It is based on a group of 120 soldiers discharged after treatment at a neurosis center. Their average age was 27, but 29 were over 30, and 10 over 40. Within 4 to 12 months after discharge (average 6 months) they were visited by a competent psychiatric social worker who tried to ascertain the occupational status, health and medica ltreatment, and domestic relations. This information was compared with pre-enlistment data obtained from the man's medical records. The civilian occupational record of 36 men was considered unsatisfactory, since it was marked by frequent changes of job or much unemployment. At the time of inquiry, 15 of the men were unemployed and 11 of them had been unemployed ever since they left the hospital. The total duration of unemployment for the whole group was ¼ of the total period since their discharge, and 22% (26) of the men account for 55% of the loss. Their age distribution did not differ materially from that of the whole group, and only 9 had had an unsatisfactory previous occupational record. The average interval between leaving hospital and starting work was 1.3 months. In spite of the general rise in wage-rates, 54 of the men are now earning less than prior to enlistment. In a few the descent in earning power was emphatic. Of the 105 employed at the time of interview, 44 were doing only light or desultory work. Apart from the work record, there was evidence that 39 patients were socially unsatisfactory. The relatives considered 58 men to be in as good health as before enlistment; 62 seemed worse. An inquiry made by mail to another group of 95 men discharged from the Army because of neurosis elicited 67 answers, of which 4 related unemployment, 12, work unsatisfactory. Fifty-one are working, and of these 15 reported poor health, 8 improved health. A similar inquiry to a group of 97 ex-soldiers elicited 66 replies: 59 of the men are working. Among the above cases most recently followed up, the proportion of men who could be classed as socially satisfactory has risen, due perhaps to the introduction of an official scheme of rehabilitation.

M. B. J. (From The Neuro-Psychiatric Institute of the Hartford Retreat)

FAIRBAIRN, W. RONALD D.: The war neuroses: their nature and significance. *Brit. M. J.*, 183, 1943.

From his experience with psychopathological conditions among military personnel during the present war and in a special hospital connected with the Emergency Medical Service, the author has formed certain conclusions regarding the nature of "war neuroses." The

term covers many clinical conditions presumably due to a traumatic experience. It is rare however to find a case in which evidence of previous psychopathological characteristics cannot be found. A traumatic experience may be defined as one which serves to precipitate an abnormal reaction through the activation of pre-existing if latent psychopathological factors. It is the author's belief that all psychopathological developments in the adult are based on a persistence of an exaggerated degree of the emotional dependence of childhood and infancy. This always involves a certain conflict which under unfavorable conditions assumes exaggerated proportions, accompanied by marked anxiety and immoderate reactions. It seems that the capacity to endure danger varies with the extent to which the individual has outgrown the stage of infantile dependence. The compulsion to return home is very marked in war neurosis, and in psychotics is sometimes displayed in fugue or in a consciously executed flight. The mental process which constitutes the distinctive psychological feature of war neurosis is that of identification: the individual fails to differentiate himself from those upon whom he depends. The more emotionally mature a person becomes, the less his emotional relationships are characterized by identification, and the more capable he is of contracting and sustaining fresh relationships. Identification imposes serious limitation on the social adaptability of the potential war neurotic. The author finds that the group spirit is the essence of morale. The phenomenon of panic in a military unit is basically one of separation-anxiety affecting all or nearly all members of the group simultaneously; it is a transient "war neurosis" occurring when the bonds uniting the group as a whole are dissolved. While any high degree of infantile dependence is inimical to morale, high morale within a group can exercise a profound influence in counteracting the ill effects of infantile dependence among its members.

M. B. J. (From The Neuro-Psychiatric Institute of the Hartford Retreat)

BLAIR, DONALD: Group psychotherapy for war neuroses. *The Lancet*, 204, 1943.

It is of the utmost importance to furnish satisfactory treatment for neuroses in the Fighting Forces. The individual therapist must be concerned with returning as many as possible to the Services in some useful capacity, and to discharge the rest to civilian life fit to begin work which will help in the national effort. How to treat patients with any success in a limited time constitutes a big problem for the Army psychiatrist. In a period of six months, the author has had to deal with 300 neurotic patients. At no time did he have less than 50 and seldom less than 60 patients at the same time—this in addition to general administrative duties in the hospital of 250 patients. He therefore adopted the following program of group psychotherapy. Type-written copies of a statement encouraging and reassuring the new patient were distributed on the day of admission. This was followed on the next day by a short interview with individual patients and a request to write out a life history with special reference to any events which may have affected mental welfare. These accounts proved of considerable assistance. The writing and phraseology alone threw light on the patient's character. Many biographies contained material that would have taken many interviews to collect. They often furnished clues to deeper complexes. The frankness of most of these compositions was surprising. Nearly all patients agreed that it was a great relief to unburden their minds, and that it was easier to write certain things than to divulge them orally. As soon as possible after the biography was written, a long interview was given each patient, during which the author made further notes and decided on the general lines of treatment. He found most cases suitable for group treatment lectures, given in a series of about 10 lectures of one hour each. The first lecture was an introductory discussion of mental conditions in general and neuroses in particular, with special reference to popular misconception as to the disgrace of mental illness. The second dealt with the interrelationship of mind and body. The third took up methods of describing the mind: (a) conscious, subconscious, and unconscious; (b) knowing (cognition), feeling (affect), and striving (conation); (c) mental reactions as the sum result of events affecting one's mind in the past. The fourth lecture comprised a description of the instincts as present in everyone, but varying in strength from one to another. The fifth related to elementary anatomy and physiology; the sixth to sentiments, complexes and mental conflicts; the seventh, to stages of mental life, the complications which may arise at each stage and the consequences of maladjusted occupation; the eighth, to sex; the ninth, to fear and a brief summary of previous lectures. The tenth lecture dealt with self-treatment; realization of the origin of symptoms; the necessity for a less selfish outlook; the importance of a sound general philosophy; and an exhortation to come to the doctor for further discussion of symptoms. By simplification and illustration of all points, the author succeeded in holding the attention of the patients. The results obtained were satisfactory.

M. B. J. (From The Neuro-Psychiatric Institute of the Hartford Retreat)

JONES, MAXWELL, AND SCARISBRICK, R.: Effort intolerance in soldiers—a review of 500 cases. *War Med.*, 901, 1942.

Cases of effort syndrome in the British Army have been less numerous in this war than in the last. This is probably largely due to the attitude of Regimental Medical Officers who reassure the men about their

hearts and in this way prevent misinterpretation of symptoms. Poor response to effort must however remain an important problem in war-time because of the increased physical demands made on the average soldier. Most of the patients seen may be loosely classified as anxiety states but the authors have attempted a more detailed classification as a preliminary to further study; this takes account of effort response, anxiety and vegetative lability. It has been found possible to separate conditions in which poor effort response is apparently due solely to physical or (constitutional) factors from the effort intolerance which may result from an acute anxiety state. Whatever the mechanism it is desirable to measure the degree of effort intolerance by objective tests. This problem is studied by measuring the respiratory response to medium work on a bicycle ergometer and the rise of lactate doing heavy work to exhaustion point. The majority of patients with effort syndrome break down before there is any evidence in the blood of advanced "physiologic" fatigue. The most successful method of treatment has been a combination of group talks by which the patients are given elementary medical education so that they may understand the meaning of their symptoms and a full use of the nursing staff with a view to raising morale. Results have been surprisingly good and of 100 consecutive discharges from hospital, 18 returned to their former duties, 43 were recommended for transfer to another regiment or for special training and 9 were sent back in a lower medical category; the remaining 30 men were discharged from the army.

Author's Abstract.

WADE, HENRY J.: Dyspepsia in the Royal Navy. *Lancet*, **243:** 636, 1942.

In the period from Oct. 1939 through Sept. 1941, there were 11564 admissions at a large Naval auxiliary hospital, of which 1963 (9%) were diagnosed as dyspeptic. The highest percentages of ulcer cases were admitted in the last quarter of 1939 and the last 2 quarters of 1940 (62%, 60% and 65%). These higher figures are due to new entries who suffered from peptic ulcer in civilian life and relapsed after a short period of active service. Otherwise the incidence of ulcer cases among the dyspeptics admitted is remarkably constant (average about 55%). A review of 1003 cases of dyspepsia emphasizes that the outstanding features of duodenal as compared with gastric ulcer are: the earlier age of onset, the earlier onset of complications; the commoner family history of ulcer; and the greater incidence of psychological factors. There is no evidence that war-time service in the Royal Navy has increased the incidence of dyspepsia as a whole. The expansion of the service and the inclusion of personnel from the prewar civilian population is more than sufficient to account for the apparent increase. Cases of nervous dyspepsia were investigated in consultation with a neuropsychiatrist. Nervous dyspepsia is not a gastric disease. Among new entries it was found that cases of nervous dyspepsia associated with anxiety state are more numerous than in any other category (40 out of 76). The changed conditions from civil life to war, especially at sea, seem to have a deleterious effect on those who possess an unstable psychosomatic balance. A large number of patients (175) with dyspepsia of uncertain origin had joined the service since the outbreak of war. The evidence indicates that a complete change from the diet of civil life has produced symptoms. There is an urgent need for organized research into all aspects of the problem of dyspepsia of uncertain origin. Most of the cases in the entire series had a long history: only 12% of the cases of duodenal ulcer and 20% of those of duodenal dyspepsia dated their symptoms from taking up war service. Of the 1003 dyspeptic cases studied, 56% had clinical ulcers, in 47% ulcer was proved radiologically (6.7% gastric, 40% duodenal and 0.5% anastomotic), 15% were cases of duodenal dyspepsia, and 24% suffered from dyspepsia of uncertain origin.

M. B. J. (From The Neuro-Psychiatric Institute of the Hartford Retreat)

STALKER, HARRY: Conscientious objectors with psychiatric states. *J. Ment. Sc.*, 52, 1943.

The author deals with this subject as it concerns the psychiatric state of the objector and not his objection. He describes 8 cases divisible into 3 groups: (1) the introverted-asocial, (2) the antisocial and (3) the mixed group combining the features of both the first and the second group. The 4 cases which fall into group 1 are diagnosed as obsessive state (1), schizophrenia (2), mixed paranoid and depressive state (1). The one case in group 2 is classified as psychopathic state. In group 3 is one case of hysteria, one of schizoid state and one of anxiety state.

All of the cases disclosed aggressive tendencies ranging from obsession of harming others to striking people. It is therefore not surprising to find pathological fear exhibited in almost all of them as such fear is often a fear of the individual's unconscious impulses. An important disclosure was the fact that in 7 out of the 8 cases reported, the father's attitude towards war had been very uninspiring and at times even abnormal. The conscientious objection was only one of many symptoms of an abnormal condition aggravated by one of two conflicts: that of being an objector or that of whether to be an objector.

L. L. (From The Neuro-Psychiatric Institute of the Hartford Retreat)

MCNIEL, EDWIN E.: Psychiatric problems in wartime Hawaii. *Hawaii M. J.*, **2:** 63, 1942.

The psychological repercussions of the attack on

Hawaii were widespread. Remarkable changes have occurred in almost every phase of their living, in economic, social and family life. Practically everyone has been under considerable emotional tension. This may be evidenced in a loss of weight; loss or increase of appetite; increase of rate of liquor consumption; poorer, more restless sleep with an increase in dreams, particularly of the fear or catastrophic type; development of gastro-intestinal difficulties with hyperacidity, gastric ulcers, or diarrhea; urinary frequency; depressive feelings; irritability; and other anxiety symptoms. Many people show decreased efficiency or poor judgment. Others do things which they can only explain on a neurotic or day-dreaming basis. For 3 weeks after the attack on Pearl Harbor, very few psychiatric cases were seen; but subsequently the patient load increased markedly both in number and in intensity of symptoms. Schizophrenia is the largest diagnostic group, with catatonic and paranoid types predominating. Many of these patients made a marginal adjustment before the war. Adjustment under wartime conditions has been more difficult. Also a stricter check and demand for higher level of performance has been made by the civilian police, the F.B.I., and military authorities. Many reports of espionage and sabotage were traced to schizophrenic and paranoid patients. Numerous cases of psychoneuroses have been seen, and a number of major hysteria. This type was rare before the war. Cases of very severe neuroses, especially with hypochondriacal trends, and particularly in the Japanese, have not been uncommon. Any obvious cause for the illness seems to be lacking. There have been relatively few alcoholic patients. Very little manic-depressive psychosis is seen. So-called war neurosis or psychosis has not been diagnosed.

M. B. J. (From The Neuro-Psychiatric Institute of the Hartford Retreat)

GUTTMAN, ERIC: Suicidal head injuries. *J. of Mental Sci.*, **93:** 1943.

This reports the case histories of 5 patients with suicidal head injuries. Two cases of endogenous depression and one reactive depression recovered mentally as the result of severe injury to the frontal lobes in two, to the temporal lobe in one case. One psychopathic depressive reaction showed no change after a laceration of the posterior temporal lobe. One recurrent endogenous depression was not influenced by a mild concussion. Comparing these cases with two cases reported in the literature the author comes to the conclusion that the recovery in his cases was not due to the focal cerebral injury, but to the combined operation of physical and psychological factors which he discusses in the paper.

Author's Abstract.

KAHN, LIEUTENANT-COMMANDER BERNARD I.: Some endocrine aspects of personality. *United States Naval Medical Bulletin*, **11:** 330, 1942.

Abnormal function in any part of the body makes its influence felt on every other portion. Obviously then, the pituitary gland which plays such a fundamental role in regulating hunger and sex drive, must, with any disturbance of its activity, alter the total person.

Best understood of the endocrines is the thyroid gland. Thyroid dysfunction when associated with Graves syndrome carries with it an involvement of the sympathetic nervous system. This thyro-sympathetic complication puts a peculiar stamp upon the personality of the individual. Deeply seated personality trends, such as those of the manic depressive or praecox, may be ushered into clinical activity by thyroid involvement, whether or not it is associated with the Graves complex.

There is a constitutional predisposition to hyperthyroidism which will implicate a sensitive thyroid gland. Such patients so delicately poised seem to suffer an extreme feeling of insecurity, a strong sense of dynamic responsibility and a tendency to turn the effects of emotional disturbance inwards. If this tendency is severe and lasting enough it may precipitate active hyperplasia of the thyroid gland. Irritability of any type should call for searching analysis of the blood to discover the extent of a lowered diffusible or ionizable calcium. Lowered function of the parathyroid gland, it is thought, bears the same relation to certain obscure conditions, as the thyroid bears to skin conditions and depressed states.

The principal personality symptoms of hypo-adrenism are a sense of weakness and exhaustion, a lack of ambition and a feeling of lassitude. Hyperfunction of the adrenal cortex results in precocious sexual development, virilism and hypertrichosis. In the adult, hypogonadism results in nervousness, flushing and eventually results in a phlegmatic, even temperament. There appears to be an inferiority complex, ideas of persecution and, as, with any abnormally functioning gland, irritability of the nervous system. The hyperfunctioning testicle results in the typical pyknic type, while the mentality may be above normal. In addition to the sexual precocity and hypertrichosis, there is concomitant nervousness, restlessness, discontent and in some cases, migraine or epilepsy.

Therefore, defects of personality, inherited or recently acquired, means a study of the endocrine balance of the individual. If a patient should become nervous and tense, complains of insomnia and psychomotor tension, and there is evidence of an inherited neurotic family, the alert doctor will make every effort to discover if this condition results from maladjusted endocrines or is a result of hereditary, structural or physiological weakness of the nervous system.

Author's Abstract.

GOLD, LEONARD: Mental characteristics associated with "essential hypertension." *Psychiat. Quart.*, **17:** 564, 1943.

Because of the increase, especially among more civilized social groups of "essential hypertension" it is imperative to create a more firm scientific basis for the clinical impression that psychic factors play a role in this type of high arterial tension. Consequently, a study of the personality traits in individuals with this type of high arterial tension has been undertaken.

Ten cases of "essential" hypertension were selected. These patients showed no evidence of organic pathology with the hypertension nor any of the mental changes known to occur with organic brain damage. The following features were then studied. 1. The significant, early developmental background of the personality. 2. The prepsychotic personality traits. 3. The character of the precipitating factors and the type of onset. 4. The type of psychotic manifestations. 5. The possibility of correlation between the fluctuations in arterial tension and the concomitant mental manifestations. 6. The presence of a continuous anxiety. 7. The presence of any fairly overt, inhibited, aggressive impulses.

A preliminary description reveals: (a) A submissive personality was found, with strong parental attachments, labile emotional reactions and periodic swings to depression. (b) Overt anxiety and inhibited aggression although present were not predominant. (c) Overt aggressive impulses when present were inhibited just previous to the onset of the psychosis. The chief complaint was a feeling of "being hindered." (d) The illness was sudden in appearance and characterized by depressive, destructive and paranoid features. Correlating the mental manifestations with rises in arterial tension, it is noted that the emotional reaction and thought content at the time of a rise are of a type which may play a part in the development of a psychosis in the given individual. When sudden changes are noted, as the daily blood pressure level is studied, the thought content of the patient at the time of rise in pressure resembles the thought content just previous to the onset of the psychosis. This content appears to be associated with certain tensions which reveal themselves in the psychic sphere and also at the level of the vegetative nervous system.

Stress is laid on the need to give definitions of what is considered hypertension in any similar future study and of the need to give the technique of correlation between the arterial tension and the mental features, if such researches are to have comparative validity.

Author's Abstract.

EISSLER, K. R.: Some psychiatric aspects of anorexia nervosa demonstrated by a case report. *Psychoanal. Rev.*, **30:** 121, 1943.

The case history of a female patient suffering from emaciation, fatigue and amenorrhea is outlined. The outstanding feature of her biography is the seemingly good adjustment up to the occurrence of the first intercourse which event broke down all her previous achievements. The ensuing disorder unmasked her earlier social behavior as based on a purely imitative mechanism without identification. Mechanisms such as this have previously been described by Ives Hendrick and Helene Deutsch. The patient's family background showed a peculiarity not frequently encountered: a mother persistently avoiding all physical contact with and affectionate expression toward her children. The same peculiarity was observed in another patient of equally severe anorexia nervosa.

An attempt is made to differentiate anorexia nervosa as a symptom in well defined neuroses and as a disease entity. Clinical application of this distinction leads to the establishment of three degrees of anorexia nervosa. The use of magical psychotherapy is necessitated by the preverbal and prelogical level on which this type of patient lives. Some basic attitudes are described.

Author's Abstract.

CAMERON, NORMAN: The place of mania among the depressions from a biological standpoint. *Jour. of Psychol.*, **14:** 181, 1942.

Two fundamental questions are considered in this paper, (*1*) *Is the "manic-depressive psychosis" actually a unitary disease process?* and (*2*) *What is the biological relationship between mania and the depressions?* The reports of physiological studies are analyzed and the positive findings of an earlier review of the biochemistry of mania and depressions summarized. A large proportion of these studies cannot be included because no attempt was made in the reports to distinguish between such gross clinical differences as anxiety, stupor, elation and agitation. Another large group of studies failed to distinguish between mania and depressions, simply lumping the data together as though the first question posed above were conclusively proved and not open to investigation. The consequence of this prevalent attitude among research and clinical workers is that little attention is paid to the origins, characteristics and results of mood disorders, while every effort is being focussed on trying to discover a purely metabolic basis to support Kraepelin's widely accepted hypothesis.

The available data, in which the necessary separation of results into those for depressions and those for mania is made, fail to establish biological differences that can compare with the obvious behavioral differences. Biological contrasts, where they occur, are evidently associated with the general activity of the patient rather than with his prevailing mood, so that depressed persons who are tense and agitated are more similar in their biological functioning to elated than to other depressed persons. This is incompatible with the hypothesis that elation and depression are basically opposed metabolic

processes; and a reconsideration of the whole problem seems indicated.

The writer regards mania as a coordinate member of the group of mood disorders which should be looked upon rather as an equivalent of depression than as its opposite biological pole. Manic excitements are affective disturbances that arise, in a minority of cases, under certain environmental and organismic conditions about which we have so far succeeded in gaining very little useful information. These conditions, as well as the whole behavioral picture in mania and the depressions, have been very much neglected for a long time. It is suggested that their further analysis may be more successful than the so far inconclusive visceral approach.

Author's Abstract.

HERTZMAN, M., AND SEITZ, C. P.: Rorschach Reactions at High Altitudes. *Jour. of Psychol.*, **14:** 245, 1942.

The Rorschach test was administered to 13 male college students, ranging in age from 17 years 8 months to 21 years 11 months, at both sea level and altitude conditions corresponding to a simulated altitude of 16,000 ft. Five other subjects who showed sufficient distress to warrant discontinuing the experiment were given the Rorschach test at sea level only.

To control repetition effects, 7 of the subjects were given their first test at sea level; the other 6 received their first test at the simulated altitude. The median interval between test and re-test was 14 days.

While the basic Rorschach pattern for each subject was not altered, there were decreases in movement and increases in color responses which could be attributed to the altitude conditions. These results would indicate that the Rorschach test is a stable one but, at the same time, capable of mirroring reactions to special conditions of stress. Anoxia effects were more clearly reflected in the Rorschach protocols when the test under experimental conditions preceded the sea level test than when the reversed sequence was employed.

An analysis of various intra-Rorschach ratios indicated that anoxia produced an increased emotional responsiveness on the part of the individual, but at the same time a partial loss of the resources necessary to cope with the newly found conditions of stress was experienced.

The sea level records of the 13 subjects who tolerated the anoxia were compared with the records of the five subjects whose adverse reactions to anoxia required the discontinuance of the experiment for them. Using a variety of Rorschach "signs" as well as over-all ratings for adjustment by three different judges, it was found that the latter group was more maladjusted than the former. There were some maladjusted individuals (on the basis of the Rorschach protocols) among those who were able to tolerate the altitude conditions. But it should be noted that each subject who could not tolerate the anoxia had an extremely poor record.

These results are not to be taken as meaning that general personal maladjustment is a major differentiating factor between tolerance of high altitude and lack of such tolerance. But they would indicate that these conditions represent special hazards to the maladjusted individual and that he is more likely to break down under them than the better adjusted person.

Author's Abstract.

WILENSKY, ABRAHAM O.: Modern treatment of thyrotoxicosis with remarks upon its importance and present war emergency. *Medical Record*, **155:** 495, 1942.

Various forms of thyrotoxicosis are endemic, not only in the United States and England, but in practically all of the countries in which American troops are now engaged.

It will be undoubtedly true that this distribution and incidence will be temporarily accentuated by the numerous emotional episodes and nervous stimulations attending the present military emergency, even more so than during the first World War.

The cases are best divided into: 1. Classical cases of exophthalmic goitre, showing all the cardinal symptoms and with all grades of severity. 2. Similar cases with the exception of exophthalmus. 3. Cases in which psychiatric symptoms of one kind or another usually, of the excitatory type form the dominating subjective symptoms. 4. Cases of localized adenoma with symptoms of mild hyperthyroidism. All hyperthyroidism cases show an intolerance for heat which will be an important factor in many of the theatres of the present war.

There are two important complicating factors: one is valvular or myocardial heart disease; and the other is diabetes. No matter in which group the cases fall, proper pre-operative preparation is of paramount importance if success is to follow. The object of all of the preparation is to eliminate or to reduce the toxicity of the hyperthyroid state to one in which operation will not be attended with any extensive amount of risk. The preparation should include: (1) rest in bed under hospital conditions; (2) high caloric diet; (3) sedation in the form of medication and by physical means; (4) final pre-operative lugolization of the patient. Not all of the cases respond as effectively as we should like; then the preparation should be continued and extended beyond the usual length of time necessary for preparation. After thorough preparation, the operation—bilateral subtotal-thyroidectomy—should be done in one stage.

In most instances when the preparation is well done and the operation is effectively carried out, a more or less complete subjective cure is obtained. In many, some of the preceding objective symptoms persist to some degree. The patients with pre-operative psychiatric disturbances should receive continuous observation

and, if necessary, psychotherapy after operation. Successful treatment of this aspect of the problem is not always easy.

The recurrences of symptoms which occur in a small proportion of the cases are due to renewal of thyroid activity, with or without hypertrophy of the stump of the gland left. Radiotherapy is sometimes indicated; but, with full blown recurrences, operation with further removal of any hyperplastic tissue should be done after careful repetition of the primary preparation.

Author's Abstract.

FITZSIMMONS, MARGARET: Treatment of problems of dependency related to permanent physical handicap. *The Family*, **23:** 1943.

This is a case work paper based on experience in a general hospital where the Social Service staff has regular psychiatric consultation.

The permanently handicapped patient inevitably has an emotional problem. Besides the illness or accident he may have suffered, he is confronted by the finality of the impairment, his permanent differentiation, and his helplessness to make the body whole again. Good emotional resources are necessary to handle the adjustment.

If the family of the patient is a neurotic one, and the impairment is imposed on faulty personality structure, the patient finds it extremely difficult to achieve a mature balance between his dependent and independent strivings. The impairment may represent punishment for bad deeds or wishes. He accepts or rejects the disability according to how deeply he is convinced he is bad. In some, the disability is a last means of love seeking. In the very depressed, an accident with resultant loss of leg or arm, say, may have been unconsciously suicidal.

The hospital or clinic, in requiring a certain amount of dependence for examination and treatment, may arouse old needs, conflicts, fears. The medical social worker can readily become the good mother who understands the patient's feelings, permits and interprets dependencies which in themselves may be causing the patient concern. Such interpretations become important when the patient is emotionally blocked in utilizing medical care of agencies for rehabilitation.

The point is made that in treatment one should try to understand the kind of person who has the disability and avoid assumptions which will obscure subtler understanding of his highly individualized needs.

Author's Abstract.

BOOK REVIEWS

MIRA, EMILIO: *Psychiatry in War.* New York, W. W. Norton, 1943, 196 pps.

Behind the tone of scientific objectivity with which he writes one senses that Mira is not only an academic psychiatrist but also an uncompromising antifascist, confident of the essential worth of his fellow-man, basically optimistic regarding the future of the race. It is likely that most people living through the trials of the fascist intervention in Spain, with all the treachery, the horrors and the heartbreaks incident to that pre-World War experimentation by our present enemies would have emerged disillusioned and cynical. One finds none of this in Mira. As a true scientist he collected and analyzed his clinical data, and as an ardent fighter for the principles of democracy he bent every energy toward building the best possible army and strengthening morale on the home front. This is no ivory tower scientist, aloof and dispassionate, fearful lest his dignity be impaired by an emotional bond which tied him closely to the common people of Spain.

In writing on the several aspects of war psychiatry Mira has an advantage possessed by relatively few American writers to date: the opportunity to test and recast his clinical and academic psychiatry in the light of actual war experience, gleaned both on the home front and in the thick of some of the bitterest fighting of the past decade. Tested thus in the fire of battle and in the turmoil and confusion on civilian fronts, his thinking is not mere theory. Much material of the greatest interest, resulting from this experience, is presented in the book.

What makes for good morale among soldiers? They must be able to focus a limitless fund of aggression against the enemy but not against their own comrades or officers. They must carefully avoid some dangers, but seek others. They must behave like wild beasts at one time, and an hour later like civilized humans. A Loyalist militiaman said: "It takes a long time to become such a mental acrobat and I am afraid of losing my mind in the process of becoming it." Yet one can only agree with Mira's belief that "the average man possesses an incredible mental plasticity and can overcome all these obstacles provided he becomes absolutely convinced of the necessity to do so." "People want to know not merely what they are fighting *against* but what they are fighting *for*." Everyone, in and out of the armed forces, "must be in the frame of mind to *make*, not merely to *support*, war." "When the subject has faith and enthusiasm in his aims, when he fights for some beloved goal—then the inactivating influence of fear will be almost insignificant, regardless of the objective dangers." The implication for us is clear and logical: a far more intense application to the problem of inculcating in our own fighting men a profound devotion to the principles of democracy, an equally profound understanding of and hatred for all that fascism denotes. To date, in the American armies, only the most tentative beginnings have been made, and even these made their first appearance late in 1943. Mira writes, on this point, "Never in history did the best brains of any nation come into such close contact with the population and the Army as in the recent Spanish war."

It was startling to read that psychiatric casualties were discharged from the Spanish Loyalist army only if they were so ill as to require commitment to an institution. Even epileptics were retained in service, being assigned to duties in which they could function adequately. Such a program was evolved for two reasons: all available manpower had to be employed, and invalided soldiers at home tended to impair civilian morale. The greatest attention was paid to the proper classification for men, assigning and reassigning them until the most satisfactory milieu, for them and the army, was found.

The American psychiatrist, trained in a dynamic psychology, will perhaps consider archaic many of Mira's remarks regarding clinical psychiatry, and some of his therapeutic procedures, in which he leans heavily on strong suggestion, painful stimulation of neurotics, the production of sterile abscesses as a type of counter-irritant in toxic and other states. Nevertheless one must bear constantly in mind the conditions under which Mira worked, and the urgency of quick rehabilitation.

The ability of the Loyalists to withstand almost barehanded the combined onslaught of the German and Italian armed might in Spain for several years is the best indication that one can hardly overestimate the importance of the morale factors in war. China's amazing resistance to Japan is another case in point, as is the Stalingrad epic.

L. J.

COBB, STANLEY: *Borderlands of Psychiatry.* Cambridge, Harvard University Press, 1943, 166 pps.

Repeatedly in the history of science, knowledge of the normal has come from a study of pathology. This little volume illustrates this process beautifully. It is not only the first adequate introduction both to psychology and psychiatry, but also a contribution to the general cultural orientation of any reader. It achieves the virtue of simplicity despite extraordinary condensation. There is not an unnecessary word, nor a confused sentence. It is an example of the value of the skeptic as teacher. It should be required reading in every course in psychology and for every

medical student. Because it takes for granted a familiarity with the technical terms of neuroanatomy and neurophysiology, a glossary of anatomical and physiological terms for the benefit of the general reader would greatly widen the field of its usefulness. It is to be hoped that this will be included in future editions.

Somewhere in "The Education of Henry Adams" Henry Adams muses on his early life in Boston and comments on his recurring amazement at the ease with which the simple Unitarian formula seemed to his New England forebears to solve all of the philosophical conundrums that had convulsed men's minds through the ages. Undoubtedly those whom Dr. Cobb characterizes as "professional quibblers" will feel similarly bemused as they read his statement "I solve the 'mind-body' problem, therefore, by stating that there is no such problem" (p. 19). This reviewer, however, is content with the author's disposal of the ancient shibboleth. Medicine returns to its roots when a leader in medical education states that there is no fundamental dichotomy between mental and physical, and that the difference between physiology and psychology is only one of complexity.

Certain chapters merit special attention. Chapter II on the Parallel Evolution of Speech, Vision, and Intellect is a beautiful condensation of this important field. It demonstrates how scientific truths evolve towards simplicity. It is furthermore a timely, useful, and condensed guide for the evaluation of intracranial wounds. The same can be said for the chapters on the functions of the frontal areas of the human brain, on the anatomical basis of the emotions, on consciousness, and on fits. Of particular significance is the implication in the chapter on consciousness that the processes of consciousness form a continuum whose various stages overlap, so that we should speak perhaps of degrees of consciousness and unconsciousness rather than of sharply segregated states.

The book closes with a chapter on *Psychoneurosis* and one on *Psychosomatics*, which can be evaluated from two standpoints, the one pedagogical and the other theoretical. From the pedagogical point of view these closing chapters share with the rest of the book its clarity, its skepticism, and its sincerity. They distinguish clearly between opinions based on established facts and those which the author frankly acknowledges to be determined by his feelings and preferences. This again is one of the great pedagogical virtues of the book; because in response to such sincerity the reader is forced to face in himself the points at which his own emotional preferences influence his attitude towards the scientific issues which are under discussion.

Thus we feel our way to a few divergences which may have some scientific significance. For instance, the reviewer finds himself putting a question mark next to Dr. Cobb's statement (p. 130) that depressive psychoses are "strongly inherited and probably metabolic disorders." Again he finds the author's concept of hysteria as a special type of disorder somewhat too restricted. His own preference is to look upon the hysterical process as a nearly ubiquitous component process which in varying strength can be found in almost any human being. Similar doubts arise over Dr. Cobb's formulation about hypochondriasis (p.132), which seems to the reviewer to be merely a special example of an obsessional compulsive state which happens for certain reasons to be focussed on problems of body health. Nor does anorexia nervosa seem to this reviewer to be "a disease sui generis" (p. 132). Again when he reads (p. 138–140) that there can be no "transmutation" from neurosis to psychosis, because they are presumed to have etiologies which differ not merely quantitatively but also qualitatively, it seems to this reviewer that Dr. Cobb abandons in some measure his sound pluralistic point of view, and blurs the picture of the continuum in mental phenomena.

It may be that these are all special instances of one underlying point of general disagreement between the author and this reviewer. The only serious lack in the volume is an adequate emphasis on the universal neurotic component of normality which links neurosis as a state of illness to the psychopathology of everyday life. Although on page 134 there is passing mention of the frequent social value of neurotic drives, it would seem that both for teaching purposes and for clarity in exposition abundant illustrative examples of the unrecognized play of marked neurotic forces in every moment of human life would be a cultural and educational addition to the text.

Throughout the book there is a tendency to emphasize the physiological factors in etiology. According to the author, physiology steers the processes of psychosomatic disease: whereas on the whole, psychological forces are limited to the role of precipitants of illness, although there are a few notable exceptions to this statement in the clinical material presented in the text.

Thus an emotional dichotomy may underly the book in spite of the author's intellectual dismissal of such dichotomies. To some extent this somewhat uneven emphasis on the physiological aspects of the problem is also expressed in the definition of the scope of psychosomatics which Dr. Cobb prefers. For Dr. Cobb it is (p. 157) "the study of the abnormal function set going by emotional stimulation in any system of the body (except the nervous system) and the study of the lesions caused by such abnormal functioning." It is possible to broaden the concept by viewing psychosomatics not as the study merely of a certain group of abnormal functions and lesions, but rather as a study of all of the processes by which tensions which

are generated on the psychological level of the body's experience, and can be partially or wholly discharged through disturbances in anatomy and physiology. The difference may not be great; and certainly there can be no doubt that the two definitions represent points of view that are rapidly converging on common goals.

Lawrence S. Kubie.

PAUL SCHILDER: *Mind, Perception and Thought in their Constructive Aspects.* Columbia University Press, New York, 1942, pp. 432.

This posthumous book of the late author is the self evident continuation of his general conceptions concerning psychophysiological problems published in "The Image and Appearance of The Human Body." He states it in the foreword: "The principles and the results gained in the investigation of the body image are used here in an attempt to investigate the principles of perception and thought. I extend the results and methods of modern psychology into a field, which so far has not been studied from this point of view."

The author divides the content into two parts: the first, "Perception and Action," and the second, "Higher Mental Functions." However, they are overlapping. One basic idea appears again and again: All senses bear signs of their common origin, since they all come from a common ground. Some sensory qualities can even be translated from one sensory modality to another. Every sensory impression has its own motility, which leads immediately to action. However, the separation between sensory impressions and motor expressions is more or less artificial. "We have to conceive of motility as the intersensory element common to all senses."

It plays an important part in every sense perception. In the case of optic perception, the better the motion is organized, the more definite object emerges. But already primitive color impression is combined with motion. They are connected with tonic responses. It is striking that in the optic imagination there is always motion. The same is true for tactile perception. The primitive tactile perception is not static but in motion, as in vision. In no other sense is movement by active innervation so important in reaching an objective perception of the outside world. In the acoustic world there is definite motion in the image and in the percepts, and a threefold motility: a tonic answer to sound, a movement towards the sound, and finally a motor tendency to produce the sound oneself. Smell and taste, like hearing and vision, is an objective sense. That presupposes a motor act to reach and perceive the object: a breathing regulation, i.e. sniffing for smell and chewing or swallowing for taste. The vestibular apparatus has a special position as uniting factor among the senses and as a general organ of tone and motility. Every change in this apparatus has an immediate effect on all our senses. Since the impressions perceived by the vestibular apparatus are only half conscious, and since it leads to a motility of an instinctual type, it is very sensitive to emotions. For this reason, any vestibular sensation has a more or less specific psychological meaning e.g. dizziness in anxiety neuroses. Schilder defines dizziness as "a danger signal in the sphere of the ego. It occurs when the ego cannot exercise its synthetic function in the senses, but it also occurs when conflicting motor and attitudinal impulses in connection with desires and strivings can no longer be united."

In a chapter on Psychoanalysis and conditioned reflexes, the author expresses his viewpoint very plainly: "Out of a feeling of insecurity, psychologists and also analysts are too happy to find experimental proof in animal experimentation. If they observe correctly they should not need proof from any other field." "Psychoanalysis with its close touch on the problems of real life can never be completely adapted to the artificial psychophysiology of Pavolv. Pavolv's physiology is pseudophysiology, popular mosaic psychology expressed in physiological terms."

Conditioning shows clearly that the attitude is one of the total organism. It is therefore possible to use almost any stimulus as a conditioning stimulus. It is only necessary that conditioned and unconditioned stimuli act simultaneously. Stimulus means to Schilder "a supposedly simple change in the situation which is answered by a change in attitude or action," since every situation comprises perception, sensation, feeling, emotion and motility.

Also, time and space are closely interwoven with motility. Changes in one of them is accompanied by changes in the others. Space and time perception are functions which depend on the libidinous structure of the individual.

As far as "action" is concerned, the author sees the beginning of human action in grasping and making action, which expresses the urge to come into opposition to objects. However, he does not believe that destruction is the final aim and goal of human action. In his opinion, no trace of a death instinct is to be found.

A greater part of the chapter on "Higher Mental Functions" is devoted to the discussion of the psychology and psychopathology of language and to the psychology of memory. As a psychopathologist himself, Schilder discusses this problem to some extent from the clinical point of view. Psychopathologists use language as their chief instrument. In almost every neurosis particular words and phrases gain a specific significance for the patient. Therefore, psychotherapy has to show what the word actually signalizes. In some cases, one word and one concept sum up the early history and the libidinous situation

of the patient. The analysis of the word and its referent may then become the nucleus of the psychotherapeutic procedure. Those words may increase by their repetition, the availability of psychic experiences, i.e. memories, which always represent "the result of a construction guided by the biologic situation." Since memories are constructed and directed by the biological needs, almost every experience can be remembered when the present situation has an important biologic similarity or partial identity with the past situation. It is one of the basic facts of psychic experience that memories cannot be destroyed.

In connection with the construction of memories, Schilder discusses the development of thoughts and emotions, and states that the processes of development of thoughts and memories are to a great extent identical. He emphasizes that in thinking the sensual content very often plays a small part in comparison with the nonsensual ones. He defines thinking "as an act directed towards objects, the performance of which has been intercepted by acts directed towards other objects." The process of thinking comes therefore nearer to action and is then closely related to instinct drives and emotions, e.g. thinking is a continuous attempt to secure the satisfaction of biological needs and tends to a contact with the world. In this sense, thinking is always socialized thinking. This tendency for socialization is imminent in all psychic acts. Also consciousness is a social function, although only within a person, so to speak. The continual interplay in testing what is right or wrong is the expression of the primary social function present in every act of a person who lives in a social group. Human beings are socialized in even the most primitive experience and also in their body image.

The psychobiological concept of Schilder culminates in his thesis that human existence consists of living at once in three spheres—"self"—"world"—"body" which form an inseparable unit.

We have to be grateful indeed to the Board of the Society for Psychotherapy and Psychopathology, which made arrangements for the publication of this book.

Felix Deutsch.

BORING, E. G.: *Sensation and Perception in the History of Experimental Psychology*. New York, Henry Holt, 1942.

The present volume is an outgrowth of a previous book, A History of Experimental Psychology, written by Dr. Boring. The two works parallel each other in the style of presentation and also in the material covered; the latest "History" is really an amplification of topics hurried over by necessity in its predecessor. One of the features that has been profitably carried over is the inclusion of the annotated bibliography at the end of each chapter.

The text is clearly not a "historian's history," and it reflects the author's purpose, ". . . to show how psychology came to be as it is now." The first two chapters are devoted to an historical development of the concepts of sensation and perception, and to the physiology of sensation. These initial chapters are more general than any others in the text; they are an overview or an ". . . introduction to the next thirteen." Six of the chapters are devoted to phenomena of vision, and three chapters deal with auditory sensation and perception. The remaining four chapters cover the areas of taste and smell, the cutaneous senses, organic sensitivity, and the perception of time and movement.

Individual topics are traced from their beginnings in philosophical speculation through the major experimental and theoretical developments. Boring does not bring the material up to date, but only to the period in which the issues remain in clear perspective, usually about 1930. This should not be construed as implying that all material up to 1930 has been covered. Noticeably absent is discussion on perceptual tests such as the Rorschach.

Clinicians will find little to satisfy their professional interests in the text as there has been no attempt to introduce clinical observations and assign them a role in the development of psychology. Apparently Dr. Boring has definite and not very inclusive views as to what constitutes experimental psychology.

It is doubtful whether any reader will find it feasible to digest the book from cover to cover. It is more of a reference work to be consulted when one's interest is aroused in the issues and personalities involved in the formation of a present day topic. Dr. Boring appreciates the importance of personal motivation in science and in scientific controversy. His cogent remarks on individual personalities help one to understand the course of development that psychology has taken. There will probably be no student of psychology in the future who will not consult Boring for some elusive fact on the special senses. Dr. Boring has made available to the student of psychology a considerable portion of professional background that formerly was wanting for lack of painstaking academic study.

James E. Birren.

MILLER, JAMES GRIER: *Unconsciousness*. New York, John Wiley and Sons, Inc., 1943.

It is very meritorious to attempt a distinction between the various meanings of the word unconscious, a term that for decades has been used more or less indiscriminately in scientific research. The author wants "to describe and differentiate carefully, the diverse sorts of human behavior which have been included under this term." If a whole book is devoted to the definition and clarification of the meanings of one term, it inevitably has to contain many repetitions, enumerations and quotations. That is the case here.

However, after one has overcome an initial resistance, one recognizes how skillfully the author has handled the enormous amount of publications, how logically he has put them together in an evolutionary way. Besides, he intersperses his own observations and nicely coined remarks. He devotes one chapter to case histories that illustrate 17 different meanings of unconscious. Chapters 4 and 5 contain the neurophysiology and states of unconsciousness, while in chapters 6 to 12, its forms are described. Every branch of psychology, clinical psychiatry and psychoanalysis are taken into meticulous consideration, and in addition, citations from Plato, Thomas Aquinas, Nietzsche, Bergson and Whitehead are given.

Fritz Moellenhoff.

Institute for Psychoanalysis: *Ten Year Report, 1932–1942.* Chicago, 1943.

When the historian of a future generation of American psychiatrists comes to write the chapter on psychoanalysis and early psychosomatic medicine he will find in this short report of the Chicago Institute for Psychoanalysis a precise representation of a large portion of psychoanalytic and early psychosomatic research. The past and present activities of the Institute and the scientific publications in which this research is crystallized are put together in very informative bibliographies. The report dealing with research has three parts: one dealing with psychosomatic medicine (gastrointestinal disturbances, bronchial asthma, essential hypertension, the sexual cycle of women, glaucoma, glycosuria, diseases of the skin), in all of which fields the Institute has made essential contributions to psychosomatic knowledge; another, called "Basic Research," dealing with psychoanalytic methodology; and the third, "Research in Briefer Methods of Psychotherapy." The remainder of the report describes the Institute's teaching and therapeutic activities,—war work, training, consultations, psychoanalytic and psychotherapeutic treatment in the out-patient department of the Institute. Of special interest to the future historian will be the comparison of this Institute's Ten Year Report with other reports of institutes for psychoanalysis, especially of European origin.

E. Grotjahn.

Armstrong, Harry C.: *Principles and Practice of Aviation Medicine.* Baltimore. The Williams & Wilkins Company, 1942. 496 pps.

Review of this book, published in 1939 and not since revised, is a difficult task. The past two years have seen a tremendous expansion in the study of aviation medicine, provoked, of course, by the urgent needs of military aviation. The largest portion of this work has been and is being carried out in Army, Navy, and civilian laboratories under war-time restrictions of secrecy. For this reason neither this reviewer nor the author is at liberty to reveal the results of recent work to the general public. It is not surprising, then, that the reviewer finds a considerable proportion of the material in this book in need of revision. No doubt the author is also fully aware of this fact.

As a whole, the book offers an excellent introduction into the general problem of aviation medicine, particularly for one unfamiliar with the field. But, because of more recent advances in many aspects, it cannot be considered a reliable source of reference.

The disproportionately large section (155 pages) on pilot selection will prove of limited value to most readers, largely because many of the criteria are quite arbitrary, and can no longer be considered applicable to present-day requirements. The neuropsychiatric examination is concerned too largely with psychologic tests of motor and sense organ coordination, and not sufficiently with the emotional health of the candidate, a far more important factor, as the experience of the present war has shown.

Most of the chapters on the special physiological problems encountered in aviation are well written and contain much useful information, in spite of the few respects in which they need revision. One notable exception, however, is the section on decompression sickness, which the reader is advised to skip. This was written at a time when very few data were available on the subject. In it the author introduces the unfortunate term "aeroembolism." The unproven assumption implicit in this term has led to much confusion, and in many respects has actually delayed the development of our understanding of the mechanism of this condition. Further, much of the experimental work presented in this section has not been substantiated in other laboratories. Some of the more practical aspects of the problem which are of pressing importance at the present time are not considered.

The special psychological hazards of aviation receive considerable emphasis, and rightly so. However, the introduction of a new term, "aero-neurosis," to describe a "special form of functional psychoneurosis appearing in airplane pilots" does not seem justified. In its essential details this reaction pattern differs in no respect from reactions occurring in all walks of civilian life and certainly with great frequency in all types of combat service.

In all, the author, a pioneer in this field, has performed a creditable job of correlating and presenting the material available to him. While in no sense an authoritative source book, the book will prove a valuable introduction to the many physicians who now find themselves by force of circumstances concerned with the problems of aviation medicine.

George L. Engel.

McGraw, Myrtle B.: *The Neuromuscular Maturation of the Human Infant.* New York, Columbia University Press, 1943.

In this short book many interesting and instructive observations on the acquiring of abilities in the infant are summarized. The first portion is devoted to a summary of somatic neural maturation of infants and the behavior patterns which are those that have been carried over in the phylogenetic development of the species. The relation of anatomical development to the suppression of certain acts and to the development of new neuromuscular performance is reviewed with the additional warning that a wide basis of morphological growth and functional development must be formed before definite relations can be established from a physio-chemical point of view.

The behavior of a newborn infant is essentially that of a decorticate preparation, with mass reflexes and unorganized movements. The author traces the gradual increase in myelinization, from those of vital pathways only at the end of the seventh fetal month, to extensive myelinization when the infant has acquired complete control. The appearance of acuity in the special senses is dependent upon anatomical changes. Infantile "spontaneous" behavior is either thalamic or follows patterns which are without definite objectives. The neuromuscular activities of infants during the first three hundred to eight hundred days of life have been studied and evaluated as percentage of time performance-relation. Many reflexes and movements are presented on this basis. These include the Moro reflex, suspension grasp (single and double hand), swimming, posture, rolling from supine to prone position, crawling and creeping, development of sitting and erect posture, and the complicated aspects of erect locomotion.

Sensory development is somewhat more difficult to observe as the expression phase must be considered. It was shown that "the velocity of development" proceeds at definite rates during the first one hundred and fifty days of life and provides a characterization of the individual in comparison with the average rate for the groups studied.

The role which neural maturation plays in early training as revealed by simple activities in twins, voiding habits, for example, indicated the futility of attempting training before proper neural pathways have opened. There is a point in maturation when a child can most efficiently learn a procedure; before this period the neural pathways may not be opened, after this period the incentive may diminish. Changing from one type of neuromuscular behavior to another and the resulting disorganization and confusion appear to be a part of development. That "maturation and learning are not different processes, merely different facets of the fundamental process of growth" should be the basis for an efficient educational system.

This monograph is not only of general interest but reveals the value of careful observation in elucidating the relationship between somatic development and functional achievements.

E. C. H. Schmidt.

Livingston, Lieutenant Commander W. K.: *Pain Mechanisms.* A Physiologic Interpretation of Causalgia and Its Related States. New York, MacMillan Company, 1943.

The subtitle of the book, "A physiological interpretation of causalgia and its related states" indicates the main topic of the author's thesis. Although it is clearly written, reading it is not easy since of necessity physiological, neuroanatomical and surgical theories and experiences are utilized in the attempt to explain the phenomena of pain in phantom limbs and of other pain conditions (e. g., low back pain). The interrelationship between organic changes and psychic irritants and their combined influences upon centrally located regulatory centers is fully discussed. Clinical case histories illustrate the problems and eludicate difficult conceptions. As to therapeutic suggestions, the author has been impressed with the success of novocaine injections into hypersensitive zones within painful areas (so-called trigger points). In many instances the analgesic agent seems to interrupt a vicious circle thus leading to a quick cure. Although written by a surgeon the essay is by no means exclusively or even predominantly surgical in its scope. The author's psychological and psychiatric approach to the problems involved, his sympathy with patients suffering from severe pain and the clarification of a large number of highly specialistic publications in comparatively simple terms contribute to make the monograph a valuable addition to the ever expanding field of treatises covering psychosomatic medicine.

Kurt E. Sande.

Adolph, Edward F.: *Physiological Regulations.* Lancaster, The Jaques Cattell Press, 1943, 502 pps.

The maturity of a particular science is appreciated when phenomena in that field are no longer presented in the form of qualitative description but as precise quantitative expressions. There is certainly little mathematics to be found in present day biological and medical writings. Mathematics implies any means of quantitative description from which generalizations are drawn in order to display uniformities in biological phenomena. Psychologists and other scientists have long found it necessary to employ such techniques. For the progress of biology and medicine it is necessary that more and more mathematics be employed.

Dr. Adolph is an exponent of such an advanced philosophy and his book, "Physiological Regulations" is an illustration of the usefulness of these methods. He uses water metabolism as a basis for his investigation in quantitative physiology or "physiometry." Following his study of selected data and aspects of water

exchanges he generalizes among the measured quantities concerned with maintenance of water metabolism. Then Dr. Adolph extends the same type of description to other components and exchanges.

Dr. Adolph's presentations are often very difficult to follow, but such obscurity should not detract from his arguments. Aside from the value of his data on regulations and metabolisms, there is a practical importance to his work. As he points out, with scientists adding "knowledge at faster and faster rates" without having plans for coordination and assimilation, the "mapping of coordinated physiological components and the prolonged search of these maps for uniformities of relations, may become a major activity of those interested in living units." Further, there is an important application in therapeutics. Since "therapy can be regarded as the removal of loads", a physician must be aware of the multiple interrelations among loads and components; the removal of one load may enhance others, and the latter may outweigh the advantage gained by the removal of one load. Thus, simple therapy, such as a saline infusion, may end disastrously unless the clinician comprehends the many components and loads concerned.

Alfred M. Freedman.

DYKE, CORNELIUS G., AND DAVIDOFF, LEO M.: *Roentgen Treatment of Diseases of the Nervous System.* Philadelphia, Lea & Febiger, 1942.

This book is an excellent condensation of the literature on X-ray treatment of nervous diseases, to which is added the rather extensive personal experiences of the authors. Well over eighty per cent of the monograph is concerned with the treatment of tumors of the brain and spinal cord. The portion of the book that reviews the technical procedures related to actual treatment should be of great value to the roentgenologist and neurosurgeon, who only rarely see cases for X-ray therapy. The therapeutic routines of several clinics that handle large numbers of tumor cases are given in detail. An excellent bibliography of the subject makes this book an important reference work for every roentgenologist's, neurologist's and neurosurgeon's library.

The combination of surgery and X-ray therapy is still far from the ultimate in the treatment of tumors of the central nervous system. Moreover, it is clear that except in a few instances, such as the medulloblastomas, there is still no universal agreement or convincing evidence as to the true value of X-ray treatment. The uncertainties of the results from X-ray therapy exist not only between histologically different groups of tumors, but are also present from one tumor to another in the same histological group. Thus, one must agree with the statement of the authors, "One need not be reminded that roentgen irradiation is a powerful agent and its value or lack of value often cannot be predicted without trial." Nevertheless, the book is an excellent start in attempting to systematize the present knowledge about a problem that has always been extremely controversial.

George L. Maltby.

CORNER, GEORGE W.: *The Hormones in Human Reproduction.* Princeton, Princeton University Press, 1942, 265 pps.

Dr. Corner discusses the hormones after he presents their biological background, a survey of the reproductive processes in both humans and animals. First describing simple binary fission in protozoans, he continues by pointing out the development and importance of bisexual reproduction. A brief discussion of the anatomy of the human generative tract is followed by an explanation of corpus luteum and follicle formation, ovulation, menstruation, pregnancy and the estrus cycle, and at the same time the role of the various hormones in these processes is described. Dr. Corner completes his book with a brief summary of the male sex hormones. The subject matter is not oversimplified, nor is important material deleted. The scientist or practitioner who desires a simple but adequate survey of the reproductive hormones will find this text profitable.

A. M. Freedman.

FRY, CLEMENTS C., AND ROSTOW, EDNA G.: *Mental Health in College.* New York, New York Commonwealth Fund, 1942.

The book is a study of case histories collected over a period of ten years, a "descriptive analysis of the problems presented by Yale students to the division of College Psychiatry and Mental Hygiene of the Department of University Health." It is divided into four parts: Introduction, problems of personality growth, reactions to the undergraduate environment, special problems. 1257 students consulted the college psychiatrist. 787 were undergraduates, almost 50 per cent freshmen. The rest came from the Graduate School. 47 per cent of all students were seen extensively, the remaining 53 per cent had a minimum of 1 and a maximum of 3 contacts with a psychiatrist. The author presents valuable observations and opinions as to the psychotherapeutic procedure with special discussions of the students' resistance, which not infrequently led to interruption of the treatment. For instance: "In most cases where parents request that a student be seen, the contact between psychiatrist and patient is not a fortunate one."

The chapter dealing with sexual growth and behavior is based on case histories. By measuring cautiously and objectively the roll of sexuality, the author succeeds very well in bringing out its importance, especially as an agent causing anxiety in many of these youngsters whom the world often likes to look at as being carefree and eternally happy. Due to the limited material the

problem of homosexuality could not be adequately treated. However, some very pertinent observations are made, for instance, that boys with more refined interests, who being lonely but eager for friendship, "receive more recognition, more security, more warmth among the homosexuals than from the rest of the community." A statistical result provokes some thought: "The proportion of sex problems in each group of students who consulted the psychiatrist from the graduate and professional schools, is as follows: School of Law 47 per cent: Graduate School 47 per cent: School of Medicine 51 per cent: Divinity School 63 per cent: School of the Fine Arts 65 per cent: School of Forestry 57 per cent: School of Music 25 per cent."

In the chapter on social adjustment of students, one misses reference to the psychology of the group as such, of its life, forms, emanations and of the resulting emotion group reactions. Doubtless the exclusive basis of case histories limits the possibilities of this study.

Fritz Moellenhoff.

DOSHAY, LEWIS J.: *The Boy Sex Offender and His Later Career.* New York, Grune & Stratton, 1943, 196 pps.

As psychiatrist of the Children's Court, New York City, Doshay studied a series of 256 juvenine male sex offenders, and traced their careers 6 years later. Of this series, only 8 were found to have committed subsequent sexual offences. He attributes this remarkably low rate of recidivism to the "lasting benefits from maximum stimulation of the inherent self-curing potentialities of shame and guilt." That is, Doshay is convinced (as evidenced by repeated insistence on the point) that the humiliation incident to exposure in the court room arouses such strong shame and guilt as to prevent repetition of the offence. However, another possible explanation for the really remarkably infrequent recidivism occurs to this reviewer. It is at least possible that youngsters who turn "spontaneously" away from such experiences may have had nothing really wrong with them in the first place, and that the "offences" were merely adolescent curiosity and experimentation, accidentally discovered and violently exposed by an outraged (guilty?) community; and that, if left alone, without benefit of the majesty of the law the result *in these cases of isolated "offence" and spontaneous revulsion* would have been the same. I refer only to these cases, of course, and not to those with definitely pathologic patterns.

His caustic attitude toward psychoanalysis does not deter the author from fairly generous quotations and references indicating that he accepts, wittingly or unwittingly, such basic analytic concepts as the unconscious, the oedipus complex, infantile sexuality, and others.

Wholly admirable is his emphasis on the prophylactic values of healthy home environment, economic security, adequate playgrounds and schools, and particularly the need for sexual education in the public schools. Of considerable interest was the finding that "adult sexual violations occurred less among the Negro than among the white subjects."

H. F. Lander.

GRINKER, ROY: *Neurology.* Third edition. Revised. With the assistance of Norman A. Levy. Springfield, Charles C. Thomas, 1943.

The third edition of Roy Grinker's "Neurology" has 1136 pages, and looks and reads even more like an encyclopedia neurologica than either of the two previous editions. With the able assistance of Norman Levy and a staff of secretaries, the enormous material of modern neurology is brought up-to-date and includes many new features such as embryological physiology, chemistry in neuropathology, electroencephalography, with many illustrations of brain waves in typical conditions and epileptic dysrhythmias, newest data on cortical representation, slipped discs and their localization, and developmental diseases are reclassified. Paul Bucy has written the chapter on brain tumors.—Again Grinker courageously breaks the time honored tradition and does not include a chapter about "Psychoneuroses" in a textbook of neurology. With the knowledge of this book in his mind, the student may calmly face any examination.

Martin Grotjahn.

LICHTMAN, S. S.: *Diseases of the Liver, Gallbladder and Bile Ducts.* Philadelphia, Lea & Febiger, 1942.

Every student and practitioner of medicine has occasion to consult a reference on some specialized aspect, and for such purposes a treatise on a specific problem is valuable. This can be exemplified by Lichtman's comprehensive, systemic survey of the structure, function, pathology, diagnosis and treatment of the disorders of the liver and biliary tract. Although subjects of academic interest are mentioned, emphasis is principally on those matters which are of greatest value in the diagnosis and treatment of hepatic dysfunction. Modern tests for the measurement of liver function are given special consideration. The ease with which reference can be made to a specific question makes this book most useful.

I. Arthur Mirsky.

KRAINES, S. H., AND THETFORD, E. S.: *Managing Your Mind.* New York, Macmillan Company, 1943.

It is somewhat difficult to do justice to this book which, to all appearances, seems chiefly directed to laymen. The authors explain simply and understand ably the variety of psychic factors which may be the underlying cause of organic diseases. When taking up the different organ systems they exemplify their arguments with illustrative case histories. Whereas the

treatise is based on psychoanalytic concepts, the psychoanalytic approach to the manifold problems which are touched upon is not discussed at all. It is the avowed purpose of the book not only to furnish a deeper understanding of the psychogenic basis of illness but also to provide the lay reader with guidance for his own deportment which, eventually, may fall under one of the many categories described in detail. Furthermore, through linking the normal with the pathological by elucidating intermediate and transitional stages, the book apparently aims at enabling the average reader to make a kind of superficial self-analysis. Recognition of disadvantageous attitudes toward life or of faulty adjustment to family or work environment is expected to lead to a review of the situation with newly gained objectivity and through it to remedial consequences. This mental hygiene outlook, first interwoven with other subject matter, finally discussed in the last chapters, seems the main justification of the title. It is to be feared that the reader will emerge with the mistaken notion that self-analysis and readjustment will be easily accomplished. He is not made to realize that the short cuts which have been offered suffer from inherent omission of essential factors. Thus the suggested "managing" of the mind will prove unsuccessful in direct ratio to the indicated necessity for the management.

Kurt E. Sande.

FINK, DAVID HAROLD: *Release from Nervous Tension.* New York, Simon & Schuster, 1943, 232 pps.

As the jacket blurb says, this is a friendly book. Naturally the jacket does not add that it is ill-informed and naive, nor that the best that can be said for it is that it probably will do little harm. It is a confused brew of Coue, Jacobson, Pavlov, and Horney, with extravagant exaggerations of the points of view of each.

Extreme statements, inconsistencies and over-simplifications mar its presentation of psychopathology. Asthma is "caused by" neurosis (p. 2). "Beneath *every* neurosis lies the conditioning of some automatic function of the body" (p. 8). "The conditioned reflex is just another name for emotional habits" (p. 16). On page VIII man is represented as being devoid of instincts; but on p. 64 instincts are recognized as a force in human affairs. Nor are the author's fundamental premises clear. Conflicts are manifested in "muscle-bound" fascial planes. Emotions are to be "controlled", without clarification of the critical issue of what role repression or suppression play in this magical process.

The concepts of therapy are equally inadequate. They are indicated largely in an avalanche of easy medical miracles. Paranoid suspicions are cured by Coueism and relaxation. Cure always comes first through relaxation and self-admonition: causes are to be ascertained only later if at all. It is to be regretted, furthermore, that this in all probability is only the first of a series of road-guides to mental health from the pen of the same author. A magazine article has already appeared in one of the digest journals, entitled, "How to Psychoanalyze Yourself"; and this by a man who when he attempts to give an example of a psychoanalytic interpretation can achieve nothing more accurate than a burlesque (cf p. 103), and who makes the elementary mistake of confusing the confrontation of a patient with his symptomatic behavior with the uncovering of underlying causative needs (p. 153). His historical summaries (p. 161) are equally inaccurate. Psychoanalysis discovered neither the unconscious nor free association but only discovered important facts about them and important ways of using them. Nor does the author appear to know that Adler was the originator of the term "organ inferiority" (p. 162).

It is difficult to find any value in such books as this, however well-intentioned they may be. Any neurotic who attempts to heal himself by following its precepts of self-help will end in deeper difficulties. One who is encouraged by the book to seek professional help will have a painful disappointment when he finds how different such treatment is from the romanticized version of it presented here.

Lawrence Kubie.

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NOTE

CONSERVATION OF SCHOLARLY JOURNALS

The American Library Association created in 1941 the Committee on Aid to Libraries in War Areas, headed by John R. Russell, the Librarian of the University of Rochester. The Committee is faced with numerous serious problems and hopes that American scholars and scientists will be of considerable aid in the solution of one of these problems.

One of the most difficult tasks in library reconstruction after the first World War was that of completing foreign institutional sets of American scholarly, scientific, and technical periodicals. The attempt to avoid a duplication of that situation is now the concern of the Committee.

Many sets of journals will be broken by the financial inability of the institutions to renew subscriptions. As far as possible they will be completed from a stock of periodicals being purchased by the Committee. Many more will have been broken through mail difficulties and loss of shipments, while still other sets will have disappeared in the destruction of libraries. The size of the eventual demand is impossible to estimate, but requests received by the Committee already give evidence that it will be enormous.

With an imminent paper shortage attempts are being made to collect old periodicals for pulp. Fearing this possible reduction in the already limited supply of scholarly and scientific journals, the Committee hopes to enlist the cooperation of subscribers to this journal in preventing the sacrifice of this type of material to the pulp demand. It is scarcely necessary to mention the appreciation of foreign institutions and scholars for this activity.

Questions concerning the project or concerning the Committee's interest in particular periodicals should be directed to Dorothy J. Comins, Executive Assistant to the Committee on Aid to Libraries in War Areas, Library of Congress Annex, Study 251, Washington, 25, D. C.

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